Set Name side by side	**Query**	**Hit Count**	**Set Name** result set
DB=USPT,PGPB,JPAB,EPAB,DWPI; PLUR=YES; OP=ADJ			
L14	l12 and L13	52	L14
L13	((435/$7)!.CCLS.)	116317	L13
L12	l1 and L11	81	L12
L11	l2 near4 l3	7755	L11
DB=USPT; PLUR=YES; OP=ADJ			
L10	5895832.pn.	1	L10
DB=USPT,PGPB,JPAB,EPAB,DWPI; PLUR=YES; OP=ADJ			
L9	(5839079| 5895832)![pn]	4	L9
L8	L7 not l5	20	L8
L7	l4 and L6	23	L7
L6	((588/$7)!.CCLS.)	4642	L6
L5	l1 same L4	28	L5
L4	l2 with L3	15678	L4
L3	coat$4 or encapsulat$4 or capsul$4	1834765	L3
L2	microb$ or bacteri$ or microorganism$1	385351	L2
L1	bioremediat$5	1470	L1

END OF SEARCH HISTORY

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Search Results -

Terms	Documents
l1 same L4	28

Database:
US Patents Full-Text Database
US Pre-Grant Publication Full-Text Database
JPO Abstracts Database
EPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L5

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Search History

DATE: Friday, March 21, 2003 Printable Copy Create Case

Set Name side by side	**Query**	**Hit Count**	**Set Name** result set
	DB=USPT,PGPB,JPAB,EPAB,DWPI; PLUR=YES; OP=ADJ		
L5	l1 same L4	28	L5
L4	l2 with L3	15678	L4
L3	coat$4 or encapsulat$4 or capsul$4	1834765	L3
L2	microb$ or bacteri$ or microorganism$1	385351	L2
L1	bioremediat$5	1470	L1

END OF SEARCH HISTORY

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Search Results - Record(s) 1 through 10 of 28 returned.

☐ 1. Document ID: US 20020117445 A1

L5: Entry 1 of 28 File: PGPB Aug 29, 2002

PGPUB-DOCUMENT-NUMBER: 20020117445
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020117445 A1

TITLE: Fermentation systems, methods, and apparatus

PUBLICATION-DATE: August 29, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Whiteman, G. Robert	Duluth	GA	US	

US-CL-CURRENT: 210/620

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw. Desc | Image

☐ 2. Document ID: US 20020098982 A1

L5: Entry 2 of 28 File: PGPB Jul 25, 2002

PGPUB-DOCUMENT-NUMBER: 20020098982
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020098982 A1

TITLE: Production and use of biosolid granules

PUBLICATION-DATE: July 25, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Burnham, Jeffrey C.	Naples	FL	US	

US-CL-CURRENT: 504/359; 504/117, 504/367, 71/64.02, 71/64.11

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw. Desc | Image

☐ 3. Document ID: US 20020078849 A1

L5: Entry 3 of 28 File: PGPB Jun 27, 2002

PGPUB-DOCUMENT-NUMBER: 20020078849
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020078849 A1

TITLE: Methods, apparatus, and systems for accelerated bioremediation of explosives

PUBLICATION-DATE: June 27, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Badger, Farrell G.	Mapleton	UT	US	
Welch, Brendan M.	Farmington	CT	US	
Thomas, Ronald D.	Woodland Hills	UT	US	
Bahr, Lyman G.	Payson	UT	US	
Richards, Dean F.	Pleasant Grove	UT	US	

US-CL-CURRENT: 102/293

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 4. Document ID: US 6334395 B1

L5: Entry 4 of 28 File: USPT Jan 1, 2002

US-PAT-NO: 6334395
DOCUMENT-IDENTIFIER: US 6334395 B1

TITLE: Methods, apparatus, and systems for accelerated bioremediation of explosives

DATE-ISSUED: January 1, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Badger; Farrell G.	Mapleton	UT		
Welch; Brendan M.	Farmington	CT		
Thomas; Ronald D.	Woodlands Hills	UT		
Bahr; Lyman G.	Payson	UT		
Richards; Dean F.	Pleasant Grove	UT		

US-CL-CURRENT: 102/293; 149/24, 588/203

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw. Desc | Image

☐ 5. Document ID: US 6331300 B1

L5: Entry 5 of 28 File: USPT Dec 18, 2001

US-PAT-NO: 6331300
DOCUMENT-IDENTIFIER: US 6331300 B1

TITLE: Compositions for providing a chemical to a microorganism

DATE-ISSUED: December 18, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Dybas; Michael J.	Lansing	MI		
Criddle; Craig S.	Lansing	MI		
Witt; Michael E.	Holt	MI		

US-CL-CURRENT: 424/93.4; 210/601, 210/610, 424/400, 424/484, 424/489, 435/252.1, 435/262.5

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 6. Document ID: US 6287846 B1

L5: Entry 6 of 28 File: USPT Sep 11, 2001

US-PAT-NO: 6287846
DOCUMENT-IDENTIFIER: US 6287846 B1

TITLE: Method and compositions for providing a chemical to a microorganism

DATE-ISSUED: September 11, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Dybas; Michael J.	Lansing	MI		
Criddle; Craig S.	Lansing	MI		
Witt; Michael E.	Holt	MI		

US-CL-CURRENT: 435/262.5; 435/253.3, 435/874

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 7. Document ID: US 6258589 B1

L5: Entry 7 of 28 File: USPT Jul 10, 2001

US-PAT-NO: 6258589
DOCUMENT-IDENTIFIER: US 6258589 B1

TITLE: Methods for providing a chemical to a microorganism

DATE-ISSUED: July 10, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Dybas; Michael J.	Lansing	MI		
Criddle; Craig S.	Lansing	MI		
Witt; Michael E.	Holt	MI		

US-CL-CURRENT: 435/262.5; 210/601, 210/610, 435/252.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 8. Document ID: US 6207056 B1

L5: Entry 8 of 28 File: USPT Mar 27, 2001

US-PAT-NO: 6207056
DOCUMENT-IDENTIFIER: US 6207056 B1

TITLE: Method for biological purification

DATE-ISSUED: March 27, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lucido; John A.	Mt. Sinai	NY		
Keenan; Daniel	Rockville Centre	NY		
Premuzic; Eugene T.	East Moriches	NY		
Lin; Mow S.	Rocky Point	NY		
Shelenkova; Ludmila	Yaphank	NY		

US-CL-CURRENT: 210/608; 210/610, 435/262

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 9. Document ID: US 6204049 B1

L5: Entry 9 of 28 File: USPT Mar 20, 2001

US-PAT-NO: 6204049
DOCUMENT-IDENTIFIER: US 6204049 B1

TITLE: Fungal compositions for bioremediation

DATE-ISSUED: March 20, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Bennett; Joan Wennstrom	New Orleans	LA		
Childress; Adele Marie	New Orleans	LA		
Wunch; Kenneth George	Metaire	LA		
Connick, Jr.; William Joseph	New Orleans	LA		

US-CL-CURRENT: 435/254.1; 424/490, 435/262, 435/262.5

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 10. Document ID: US 5954868 A

L5: Entry 10 of 28 File: USPT Sep 21, 1999

US-PAT-NO: 5954868
DOCUMENT-IDENTIFIER: US 5954868 A

TITLE: Method and composition for enhanced bioremediation of oil

DATE-ISSUED: September 21, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Felix; Edward A.	Cypress	TX		
Hruza; Sandra L.	Houston	TX		

US-CL-CURRENT: 106/243; 106/250

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 11. Document ID: US 5914182 A

L5: Entry 11 of 28 File: USPT Jun 22, 1999

US-PAT-NO: 5914182
DOCUMENT-IDENTIFIER: US 5914182 A

TITLE: Materials and methods for the immobilization of bioactive species onto polymeric substrates

DATE-ISSUED: June 22, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Drumheller; Paul D.	Flagstaff	AZ		

US-CL-CURRENT: 428/308.4

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☑ 12. Document ID: US 5910245 A

L5: Entry 12 of 28 File: USPT Jun 8, 1999

US-PAT-NO: 5910245
DOCUMENT-IDENTIFIER: US 5910245 A

TITLE: Bioremediation well and method for bioremediation treatment of contaminated water

DATE-ISSUED: June 8, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Bernhardt; Bruno	Reutlingen			DE
Langley; William G.	Charlotte	NC		
Klingel; Eric J.	Charlotte	NC		
Mueller; James G.	Gulf Breeze	FL		
Lakhwala; Fayaz	Gulf Breeze	FL		

US-CL-CURRENT: 210/170; 210/188, 210/195.1, 210/605, 210/747, 210/901

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 13. Document ID: US 5897955 A

L5: Entry 13 of 28 File: USPT Apr 27, 1999

US-PAT-NO: 5897955
DOCUMENT-IDENTIFIER: US 5897955 A

TITLE: Materials and methods for the immobilization of bioactive species onto polymeric substrates

DATE-ISSUED: April 27, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Drumheller; Paul D.	Flagstaff	AZ		

US-CL-CURRENT: 428/422; 428/426, 428/432, 435/180, 435/181, 435/7.92

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 14. Document ID: US 5874165 A

L5: Entry 14 of 28 File: USPT Feb 23, 1999

US-PAT-NO: 5874165
DOCUMENT-IDENTIFIER: US 5874165 A

TITLE: Materials and method for the immobilization of bioactive species onto polymeric subtrates

DATE-ISSUED: February 23, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Drumheller; Paul D.	Flagstaff	AZ		

US-CL-CURRENT: 428/308.4

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 15. Document ID: US 5840182 A

L5: Entry 15 of 28 File: USPT Nov 24, 1998

US-PAT-NO: 5840182
DOCUMENT-IDENTIFIER: US 5840182 A

TITLE: Apparatus and method for biological purification of waste

DATE-ISSUED: November 24, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lucido; John A.	Mt. Sinai	NY		
Keenan; Daniel	Rockville Centre	NY		
Premuzic; Eugene T.	East Moriches	NY		
Lin; Mow S.	Rocky Point	NY		
Shelenkova; Ludmila	Yaphank	NY		

US-CL-CURRENT: 210/202; 210/205, 210/532.2, 210/538, 210/610, 435/262

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC
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☐ 16. Document ID: US 5763815 A

L5: Entry 16 of 28 File: USPT Jun 9, 1998

US-PAT-NO: 5763815
DOCUMENT-IDENTIFIER: US 5763815 A

TITLE: Apparatus for bioemediating explosives

DATE-ISSUED: June 9, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Thomas; Ronald D.	Woodland Hills	UT		
Bahr; Lyman G.	Payson	UT		
Dunning; Walter B.	Sonora	CA		
Richards; Dean F.	Pleasant Grove	UT		

US-CL-CURRENT: 102/293; 435/262.5, 588/202, 588/203, 89/1.11

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC
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☐ 17. Document ID: US 5736669 A

L5: Entry 17 of 28 File: USPT Apr 7, 1998

US-PAT-NO: 5736669
DOCUMENT-IDENTIFIER: US 5736669 A

TITLE: Systems for bioremediating explosives

DATE-ISSUED: April 7, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Thomas; Ronald D.	Woodland Hills	UT		
Bahr; Lyman G.	Payson	UT		
Dunning; Walter B.	Sonora	CA		
Richards; Dean F.	Pleasant Grove	UT		

US-CL-CURRENT: 102/293; 435/262.5, 588/203

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 18. Document ID: US 5725885 A

L5: Entry 18 of 28 File: USPT Mar 10, 1998

US-PAT-NO: 5725885
DOCUMENT-IDENTIFIER: US 5725885 A

TITLE: Composition for enhanced bioremediation of oil

DATE-ISSUED: March 10, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Felix; Edward A.	Cypress	TX		
Hruza; Sandra L.	Houston	TX		

US-CL-CURRENT: 424/490; 210/610, 210/922, 424/498, 435/177, 435/281, 71/64.07, 71/904

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 19. Document ID: US 5503738 A

L5: Entry 19 of 28 File: USPT Apr 2, 1996

US-PAT-NO: 5503738
DOCUMENT-IDENTIFIER: US 5503738 A

TITLE: Apparatus for biological remediation of vaporous pollutants

DATE-ISSUED: April 2, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
DeFilippi; Louis J.	Palatine	IL		
Lupton; Francis S.	Evanston	IL		
Mashayekhi; Mansour	Huntington	WV		

US-CL-CURRENT: 210/150; 435/266, 96/153

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 20. Document ID: US 5492881 A

L5: Entry 20 of 28 File: USPT Feb 20, 1996

US-PAT-NO: 5492881
DOCUMENT-IDENTIFIER: US 5492881 A

TITLE: Sorbent system

DATE-ISSUED: February 20, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Diamond; Charles M.	Bath	NH	03740-0018	

US-CL-CURRENT: 502/401; 502/404, 502/407, 502/412

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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Search Results - Record(s) 21 through 28 of 28 returned.

☐ 21. Document ID: US 5443845 A

L5: Entry 21 of 28 File: USPT Aug 22, 1995

US-PAT-NO: 5443845
DOCUMENT-IDENTIFIER: US 5443845 A

TITLE: Composition for enhanced bioremediation of petroleum

DATE-ISSUED: August 22, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Felix; Edward A.	Houston	TX		

US-CL-CURRENT: 424/490; 210/610, 210/922, 424/498, 435/177, 435/281, 71/64.07

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

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☐ 22. Document ID: US 5413714 A

L5: Entry 22 of 28 File: USPT May 9, 1995

US-PAT-NO: 5413714
DOCUMENT-IDENTIFIER: US 5413714 A

TITLE: Process for biological remediation of vaporous pollutants

DATE-ISSUED: May 9, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
DeFilippi; Louis J.	Palatine	IL		
Lupton; Francis S.	Evanston	IL		
Mashayekhi; Mansour	Huntington	WV		

US-CL-CURRENT: 210/617; 210/908, 95/211, 95/237, 95/291

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

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☐ 23. Document ID: WO 9946210 A1

L5: Entry 23 of 28 File: EPAB Sep 16, 1999

PUB-NO: WO009946210A1
DOCUMENT-IDENTIFIER: WO 9946210 A1
TITLE: METHOD AND COMPOSITION FOR ENHANCED BIOREMEDIATION OF OIL

PUBN-DATE: September 16, 1999

INVENTOR-INFORMATION:

NAME	COUNTRY
FELIX, EDWARD	
HRUZA, SANDRA L	

INT-CL (IPC): C02 F 3/34; C02 F 1/68
EUR-CL (EPC): C02F001/68; C02F003/34

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 24. Document ID: WO 9638381 A1

L5: Entry 24 of 28 File: EPAB Dec 5, 1996

PUB-NO: WO009638381A1
DOCUMENT-IDENTIFIER: WO 9638381 A1
TITLE: METHOD OF BIOTREATMENT FOR SOLID MATERIALS IN A NONSTIRRED SURFACE BIOREACTOR

PUBN-DATE: December 5, 1996

INVENTOR-INFORMATION:

NAME	COUNTRY
KOHR, WILLIAM J	

INT-CL (IPC): C01 G 7/00; C01 G 28/00; C22 B 1/00; C22 B 1/11; C22 B 3/00; C22 B 3/04; B01 D 11/00
EUR-CL (EPC): C12P003/00; C22B001/00, C22B011/04 , C22B011/08 , C22B011/00 , B09C001/10 , C22B003/18

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 25. Document ID: WO 9508513 A1

L5: Entry 25 of 28 File: EPAB Mar 30, 1995

PUB-NO: WO009508513A1
DOCUMENT-IDENTIFIER: WO 9508513 A1
TITLE: BIOCOMPOSITE COMPRISING A MICROORGANISM AND AN ADDITIVE IN A FORMULATION MATRIX FOR BIOREMEDIATION AND POLLUTION CONTROL

PUBN-DATE: March 30, 1995

INVENTOR-INFORMATION:

NAME	COUNTRY
LIN, JIAN-ER	
MUELLER, JAMES G	
PRITCHARD, P HAP	

INT-CL (IPC): C02 F 3/12; C02 F 3/10; C02 F 3/34
EUR-CL (EPC): B09C001/10; C02F003/10, C02F003/12 , C02F003/34

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 26. Document ID: WO 200000648 A1 AU 9952046 A US 6121038 A EP 1088109 A1 US 6451585 B1

L5: Entry 26 of 28 File: DWPI Jan 6, 2000

DERWENT-ACC-NO: 2000-117173
DERWENT-WEEK: 200271

TITLE: Preemptive bioremediation of oil spills

INVENTOR: KIRSCHNER, L

PRIORITY-DATA: 1998US-0105387 (June 26, 1998), 2000US-0595382 (June 15, 2000)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 200000648 A1	January 6, 2000	E	023	C12S013/00
AU 9952046 A	January 17, 2000		000	C12S013/00
US 6121038 A	September 19, 2000		000	C12S013/00
EP 1088109 A1	April 4, 2001	E	000	C12S013/00
US 6451585 B1	September 17, 2002		000	C12S013/00

INT-CL (IPC): C12 S 13/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw. Desc | Clip Img | Image

☐ 27. Document ID: WO 9508523 A1 CA 2171086 C EP 748304 A1 US 5618329 A JP 09506290 W SG 48291 A1 EP 748304 B1 DE 69426464 E

L5: Entry 27 of 28 File: DWPI Mar 30, 1995

DERWENT-ACC-NO: 1995-139525
DERWENT-WEEK: 200213

TITLE: Improved process for enhancing bio-remediation of hydrocarbon contaminated soils and water - by controlled release of nutrients at rate consistent with growth rates

INVENTOR: DRAKE, E N

PRIORITY-DATA: 1993US-0125059 (September 21, 1993), 1995US-0515552 (August 16, 1995)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 9508523 A1	March 30, 1995	E	015	C07B063/00
CA 2171086 C	February 5, 2002	E	000	B09C001/10
EP 748304 A1	December 18, 1996	E	000	C07B063/00
US 5618329 A	April 8, 1997		006	C05G003/00
JP 09506290 W	June 24, 1997		013	B09C001/10
SG 48291 A1	April 17, 1998		000	C05G003/00
EP 748304 B1	December 20, 2000	E	000	C07B063/00
DE 69426464 E	January 25, 2001		000	C07B063/00

INT-CL (IPC): A62 B 3/00; B09 C 1/10; C02 F 3/00; C02 F 3/34; C05 F 11/08; C05 G 3/00; C07 B 63/00; C09 K 17/32; C09 K 103:00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Clip Img | Image

28. Document ID: WO 9200370 A AU 9180723 A

L5: Entry 28 of 28 File: DWPI Jan 9, 1992

DERWENT-ACC-NO: 1992-041552
DERWENT-WEEK: 199205

TITLE: New Pseudomonas strain B-1 - isolated from rhizome-spherical soil around oxalate-producing plants, used for degrading oxalate in wastes

INVENTOR: BEAUDETTE, L; GOULD, W D ; MCCREADY, R G L ; THE, K I

PRIORITY-DATA: 1990US-0543025 (June 25, 1990)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 9200370 A	January 9, 1992		000	
AU 9180723 A	February 27, 1992		000	

INT-CL (IPC): C12N 1/20; C12R 1/38

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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L5: Entry 12 of 28 File: USPT Jun 8, 1999

DOCUMENT-IDENTIFIER: US 5910245 A
TITLE: Bioremediation well and method for bioremediation treatment of contaminated water

Detailed Description Text (13):
Microorganisms are used in immobilized form (attached or encapsulated) when used in the in situ bioremediation well of the present invention. The method of immobilization is based on the ability of the selected microorganism to form a biofilm. For a good biofilm former, biosupports such as granular activated carbon, diatomaceous earth, silica sand, glass beads, ceramic rings, plastic rings (polyvinyl chloride), microporous plastic sheets, and microporous plastic discs may be used. In the case of a poor biofilm former, the cells are encapsulated or immobilized in microporous support material such as calcium alginate, polyurethane, or polyacrylamide hydrazide. In situ bioreactors can be designed to accommodate and house indigenous microflora or designed to be inoculated with any of a wide variety of specially selected microflora strains, depending upon typical design criteria, such as type of contamination to be treated, environmental considerations, and microflora availability.

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Search Results - Record(s) 1 through 10 of 20 returned.

☐ 1. Document ID: US 6524447 B1

L8: Entry 1 of 20 File: USPT Feb 25, 2003

US-PAT-NO: 6524447
DOCUMENT-IDENTIFIER: US 6524447 B1

TITLE: Apparatus and method for photocatalytic purification and disinfection of water and ultrapure water

DATE-ISSUED: February 25, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Carmignani; Gary M.	Occidental	CA		
Frederick; Lee W.	Santa Rosa	CA		

US-CL-CURRENT: 204/158.2; 204/157.15, 204/157.3, 210/748, 422/186.3, 588/222

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☑ 2. Document ID: US 6465706 B1

L8: Entry 2 of 20 File: USPT Oct 15, 2002

US-PAT-NO: 6465706
DOCUMENT-IDENTIFIER: US 6465706 B1

TITLE: Encapsulation method for maintaining biodecontamination activity

DATE-ISSUED: October 15, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Rogers; Robert D.	Idaho Falls	ID		
Hamilton; Melinda A.	Idaho Falls	ID		
Nelson; Lee O.	Idaho Falls	ID		
Benson; Jennifer	Cockermouth			GB
Green; Martin J.	Wooton			GB
Milner; Timothy N.	Centerville	VA		

US-CL-CURRENT: 588/1; 435/262.5

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 3. Document ID: US 6312605 B1

L8: Entry 3 of 20 File: USPT Nov 6, 2001

US-PAT-NO: 6312605
DOCUMENT-IDENTIFIER: US 6312605 B1

TITLE: Gas-gas-water treatment for groundwater and soil remediation

DATE-ISSUED: November 6, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kerfoot; William B.	Falmouth	MA	02649	

US-CL-CURRENT: 210/741; 166/250.02, 210/170, 210/220, 210/747, 210/760, 210/763, 210/908, 210/909, 588/206, 588/248

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 4. Document ID: US 6241856 B1

L8: Entry 4 of 20 File: USPT Jun 5, 2001

US-PAT-NO: 6241856
DOCUMENT-IDENTIFIER: US 6241856 B1

TITLE: Enhanced oxidation of air contaminants on an ultra-low density UV-accessible aerogel photocatalyst

DATE-ISSUED: June 5, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Newman; Gerard K.	Oklahoma City	OK		
Harwell; Jeffrey H.	Norman	OK		
Lobban; Lance	Norman	OK		

US-CL-CURRENT: 204/157.3; 204/158.2, 588/227

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 5. Document ID: US 6224534 B1

L8: Entry 5 of 20 File: USPT May 1, 2001

US-PAT-NO: 6224534
DOCUMENT-IDENTIFIER: US 6224534 B1

TITLE: Treatments for cuttings from offshore rigs

DATE-ISSUED: May 1, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Limia; Jose M.	Spring	TX		
Quintero; Lirio	Houston	TX		

US-CL-CURRENT: 588/250; 134/40, 175/66, 210/925, 588/252

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC
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☐ 6. Document ID: US 6197081 B1

L8: Entry 6 of 20 File: USPT Mar 6, 2001

US-PAT-NO: 6197081
DOCUMENT-IDENTIFIER: US 6197081 B1

TITLE: Method for bio-refining waste organic material to produce denatured and sterile nutrient products

DATE-ISSUED: March 6, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Schmidt; Erick	Ponoka, Alberta			CA

US-CL-CURRENT: 71/1; 588/249, 588/258, 71/11, 71/12, 71/13, 71/15, 71/17, 71/18, 71/19, 71/20, 71/22, 71/23

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC
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☐ 7. Document ID: US 6180548 B1

L8: Entry 7 of 20 File: USPT Jan 30, 2001

US-PAT-NO: 6180548
DOCUMENT-IDENTIFIER: US 6180548 B1

TITLE: Environment-purifying material and its manufacturing method

DATE-ISSUED: January 30, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Taoda; Hiroshi	Meito-ku, Nagoya-shi, Aichi			JP
Nonami; Toru	Meito-ku, Nagoya-shi, Aichi			JP
Aramaki; Fujio	Kawasaki			JP
Aramaki; Shoshichi	Fujisawa			JP

US-CL-CURRENT: 501/137; 501/135, 501/136, 585/260, 588/901

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 8. Document ID: US 6120627 A

L8: Entry 8 of 20 File: USPT Sep 19, 2000

US-PAT-NO: 6120627
DOCUMENT-IDENTIFIER: US 6120627 A

TITLE: Explosive with bioremediating capacity

DATE-ISSUED: September 19, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Badger; Farrell G.	Mapleton	UT		
Welch; Brendan M.	Farmington	CT		
Thomas; Ronald D.	Woodland Hills	UT		
Bahr; Lyman G.	Payson	UT		
Richards; Dean F.	Pleasant Grove	UT		

US-CL-CURRENT: 149/108.8; 102/293, 149/124, 588/203

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 9. Document ID: US 6030549 A

L8: Entry 9 of 20 File: USPT Feb 29, 2000

US-PAT-NO: 6030549
DOCUMENT-IDENTIFIER: US 6030549 A

TITLE: Dupoly process for treatment of depleted uranium and production of beneficial end products

DATE-ISSUED: February 29, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kalb; Paul D.	Wading River	NY		
Adams; Jay W.	Stony Brook	NY		
Lageraaen; Paul R.	Seaford	NY		
Cooley; Carl R.	Gaithersburg	MD		

US-CL-CURRENT: 252/478; 250/515.1, 252/625, 588/6, 588/8

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 10. Document ID: US 5926772 A

L8: Entry 10 of 20 File: USPT Jul 20, 1999

US-PAT-NO: 5926772
DOCUMENT-IDENTIFIER: US 5926772 A

TITLE: Composition and process for the encapsulation and stabilization of radioactive, hazardous and mixed wastes

DATE-ISSUED: July 20, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kalb; Paul D.	Wading River	NY		
Colombo; Peter	Patchogue	NY		

US-CL-CURRENT: 588/8; 250/506.1, 264/.5, 588/255, 588/259, 976/DIG.383

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 11. Document ID: US 5877390 A

L8: Entry 11 of 20 File: USPT Mar 2, 1999

US-PAT-NO: 5877390
DOCUMENT-IDENTIFIER: US 5877390 A

TITLE: Method for dispersing chemicals and microorganisms into soil using explosives

DATE-ISSUED: March 2, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kuriyama; Akira	Atsugi			JP
Kawabata; Yuji	Kushihashi			JP

US-CL-CURRENT: 588/205; 166/63, 222/637, 405/263, 435/262.5

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 12. Document ID: US 5732364 A

L8: Entry 12 of 20 File: USPT Mar 24, 1998

US-PAT-NO: 5732364
DOCUMENT-IDENTIFIER: US 5732364 A

TITLE: Composition and process for the encapsulation and stabilization of radioactive, hazardous and mixed wastes

DATE-ISSUED: March 24, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kalb; Paul D.	Wading River	NY		
Colombo; Peter	Patchogue	NY		

US-CL-CURRENT: 588/8; 264/.5, 264/478, 588/255, 976/DIG.383

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 13. Document ID: US 5703131 A

L8: Entry 13 of 20 File: USPT Dec 30, 1997

US-PAT-NO: 5703131
DOCUMENT-IDENTIFIER: US 5703131 A

TITLE: Method for the detoxification of mustard gas sulfur-containing quaternary ammonium ionene polymers and their use as microbicides

DATE-ISSUED: December 30, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Puckett; Wallace E.	Memphis	TN		
Zollinger; Mark L.	Memphis	TN		
Corral; Fernando Del	Memphis	TN		

US-CL-CURRENT: 514/642; 504/100, 504/160, 564/292, 564/295, 564/296, 588/200, 588/206

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 14. Document ID: US 5649323 A

L8: Entry 14 of 20 File: USPT Jul 15, 1997

US-PAT-NO: 5649323
DOCUMENT-IDENTIFIER: US 5649323 A

TITLE: Composition and process for the encapsulation and stabilization of radioactive hazardous and mixed wastes

DATE-ISSUED: July 15, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kalb; Paul D.	Wading River	NY	11792	
Colombo; Peter	Patchogue	NY	11772	

US-CL-CURRENT: 588/8; 252/625, 588/255, 976/DIG.383

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 15. Document ID: US 5458747 A

L8: Entry 15 of 20 File: USPT Oct 17, 1995

US-PAT-NO: 5458747
DOCUMENT-IDENTIFIER: US 5458747 A

TITLE: Insitu bio-electrokinetic remediation of contaminated soils containing hazardous mixed wastes

DATE-ISSUED: October 17, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Marks; Robert E.	Baton Rouge	LA		
Acar; Yalcin B.	Baton Rouge	LA		
Gale; Robert J.	Baton Rouge	LA		

US-CL-CURRENT: 205/702; 204/515, 205/688, 205/766, 205/771, 588/204

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 16. Document ID: US 5387717 A

L8: Entry 16 of 20 File: USPT Feb 7, 1995

US-PAT-NO: 5387717
DOCUMENT-IDENTIFIER: US 5387717 A

TITLE: Method for the detoxification of mustard gas, sulfur-containing quaternary ammonium ionene polymers and their use as microbicides

DATE-ISSUED: February 7, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Puckett; Wallace E.	Memphis	TN		
Zollinger; Mark L.	Memphis	TN		
Corral; Fernando D.	Memphis	TN		

US-CL-CURRENT: 564/295; 504/100, 504/160, 564/292, 564/296, 588/200, 588/206

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 17. Document ID: US 5342589 A

L8: Entry 17 of 20 File: USPT Aug 30, 1994

US-PAT-NO: 5342589
DOCUMENT-IDENTIFIER: US 5342589 A

TITLE: Process for converting chromium dioxide magnetic pigment particles into nonmagnetic chromium (III) oxide

DATE-ISSUED: August 30, 1994

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tsakanikas; Peter D.	Tucson	AZ		
Osborne; Joseph M.	Stillwater	MN		

US-CL-CURRENT: 423/53; 252/62.54, 423/DIG.18, 588/234

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw. Desc | Image

☐ 18. Document ID: US 5304704 A

L8: Entry 18 of 20 File: USPT Apr 19, 1994

US-PAT-NO: 5304704
DOCUMENT-IDENTIFIER: US 5304704 A

TITLE: Method and apparatus for soil remediation

DATE-ISSUED: April 19, 1994

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kammeraad; Norman	Hudsonville	MI	49426	

US-CL-CURRENT: 588/249; 210/749, 210/909, 405/128.75, 405/264

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 19. Document ID: US 5164123 A

L8: Entry 19 of 20 File: USPT Nov 17, 1992

US-PAT-NO: 5164123
DOCUMENT-IDENTIFIER: US 5164123 A

TITLE: Encapsulation of toxic waste

DATE-ISSUED: November 17, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Goudy, Jr.; Paul R.	Bayside	WI		

US-CL-CURRENT: 588/6; 264/.5, 264/138, 264/141, 427/214, 427/220, 427/221, 427/407.1, 427/6

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 20. Document ID: US 4187187 A

L8: Entry 20 of 20 File: USPT Feb 5, 1980

US-PAT-NO: 4187187
DOCUMENT-IDENTIFIER: US 4187187 A

TITLE: Method and apparatus for pollutant spill control

DATE-ISSUED: February 5, 1980

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Turbeville; Joseph E.	Tampa	FL	33609	

US-CL-CURRENT: 252/62.54; 210/242.4, 210/924, 502/402, 502/406, 502/5, 502/522, 588/901

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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L8: Entry 2 of 20 File: USPT Oct 15, 2002

DOCUMENT-IDENTIFIER: US 6465706 B1
TITLE: Encapsulation method for maintaining biodecontamination activity

Abstract Text (1):
A method for maintaining the viability and subsequent activity of microorganisms utilized in a variety of environments to promote biodecontamination of surfaces. One application involves the decontamination of concrete surfaces. Encapsulation of microbial influenced degradation (MID) microorganisms has shown that MID activity is effectively maintained under passive conditions, that is, without manual addition of moisture or nutrients, for an extended period of time.

Brief Summary Text (15):
To achieve the forgoing objects, and in accordance with the invention as embodied and broadly described herein, the present invention relates to a new and useful method for microbial influenced degradation of contaminated structures. The preferred method of the present invention is a biomediated process for removing contamination from a cementitious surface utilizing encapsulated microorganisms for the microbial influenced degradation. The encapsulated microorganisms of the present invention do not require the manual addition of moisture or nutrients to maintain conditions conducive to growth. Thus, the encapsulated microorganisms are simply sprayed or painted on to the contaminated surface and left for a period of time sufficient for microbial influenced degradation activity to degrade the cementitious surface to a selected depth.

Brief Summary Text (16):
The process preferably comprises applying a substantially uniform coating of the encapsulated microorganism to a contaminated cementitious surface. The microbial influenced degradation activity is preferably permitted to continue until the cementitious surface has been degraded to a desired depth. It has been demonstrated that radioactive contamination is usually localized in the first 1-2 mm of cementitious material. The degraded layer is preferably removed by brushing, washing or scrubbing the degraded cementitious surface.

Detailed Description Text (4):
Therefore, the present invention is directed to a method for the maintenance of appropriate levels of moisture and nutrients at the concrete surface without the need for additional manual applications thereof. Specifically, the method of the present invention utilizes encapsulation of MID microorganisms to eliminate the need for manual application of moisture and nutrients for degradation of contaminated cementitious surfaces.

Detailed Description Text (5):
The necessary components of the present invention include a microorganism, an encapsulation material, and a substrate such as a contaminated cementitious surface. Each of these components will be described individually herein prior to discussion of the method of the present invention. The terms "a," "an," and "the" as used in the specification and the appended claims include plural referents unless the context clearly dictates otherwise. Thus, a reference to "a microorganism" includes a reference to two or more of such microorganisms, "a bacteria" includes two or more of such bacteria, etc.

Detailed Description Text (13):

The encapsulation material utilized in accordance with the present invention is combined with at least one type of mid microorganism, and includes a supply of appropriate nutrients and moisture. The resulting encapsulated microorganism requires no additional manual application of nutrients or moisture upon application to a contaminated surface for microbial influenced degradation. Thus, the encapsulated microorganism is referred to herein as being passively supplied with moisture and appropriate nutrients.

Detailed Description Text (14):
Suitable encapsulation materials for this invention are natural or synthetic polymeric binder materials. These materials should be able to encapsulate the microorganism, the moisture, and/or nutrients of this present invention in such a way that the nutrients and moisture are available to the microorganism and allow the microorganism to degrade the substrate on which they are applied. Examples of polymeric binder materials are natural and synthetic gels and foams. Natural and/or synthetic gelatin polymers are most preferred.

Detailed Description Text (15):
Preferred encapsulation materials are those which maintain sufficient adhesion to the substrate to adhere to the substrate during the degradation phase such as on a vertical surface, but which are readily removed at the end of the phase. The encapsulation materials preferably can be applied through spraying equipment, are non-toxic to the microorganisms, are gas permeable, hold their characteristics under acidic conditions, are easily applied and removed, and when dealing with radioactive contamination, are resistant to radioactivity.

Detailed Description Text (16):
Suitable examples of gels for encapsulation purposes include, but are not limited to, PrimaCel.TM., also known as EX-7948, Cellulon.RTM., KelcoGel.RTM., KELGIN.RTM., KELZAN.RTM., all by Monsanto Kelco Industrial Biopolymers. It should be appreciated that other gel-encapsulation materials which provide nutrients, moisture, or both, to the MID microorganisms, such as but not limited to foams or other viscous material, are within the scope of the present invention.

Detailed Description Text (17):
While conventional gels are formed at about 55.degree. C., the preferred gel-encapsulation material, such as that used to encapsulate T. thiooxidans bacteria, is formed at a temperature of less than about 30.degree. C. This relatively low temperature is used to avoid killing the bacteria.

Detailed Description Text (18):
A preferred gel-encapsulation material in accordance with the present invention comprises about 2 to about 5 of dry gel additive blended with about 500 to about 1000 ml of water, about 5 to about 30 grams of sulfur, and about 0.001 to about 0.1 grams of ammonium molybdo-phosphate. Alternatively, semi-dry gel additive is used in place of the dry additive. The mixture is blended in a high-shear mixer to produce a smooth, consistent gel, and then the microorganism, such as T. thiooxidans, is added to the gel by way of a low-shear mixer. A preferred amount of microorganism is about 1.times.10.sup.9 to about 1.times.10.sup.11 per liter of the gel. The encapsulated microorganism is then ready to be utilized on a substrate.

Detailed Description Text (21):
To perform the method of the present invention, an effective amount of the encapsulated microorganism such as described above, is sprayed or painted in a substantially uniform coating on a contaminated surface. An effective amount means an amount of a encapsulated microorganism that is sufficient to provide a selected degradative effect and performance under selected parameters. A person of ordinary skill in the art should be able determine such an effective amount without undue experimentation according to the guidelines provided herein. One example of an effective amount of microorganism encapsulation-mixture is a sprayed thickness of about 1 mm to about 5 mm on a substrate.

Detailed Description Text (22):
In the case of a particularly "hot" radioactive area, the gel-encapsulated microorganism is preferably sprayed by means of remote application, which does not

require the presence of an actual worker dressed in biological protective wear, and thus reduces exposure and risk.

Detailed Description Text (23):
The encapsulated microorganisms are preferably allowed to remain on the cementitious surface for an amount of time sufficient for microbial influenced degradation activity to degrade the cementitious surface to a selected depth. Those of skill in the art recognize that this sufficient amount of time will vary according to substrate and the depth required to eliminate the contaminated portions of the substrate. For example, microbial influenced degradation of a cementitious surface should extend up to about 4 mm, and preferably up to about 2 mm, into the surface to substantially degrade the contaminated layer. It has been demonstrated that a sufficient amount of time for this selected depth of degradation is about 12-18 months. It follows that an amount of time sufficient for microbial influenced degradation of less depth may take less time.

Current US Original Classification (1):
588/1

CLAIMS:

1. A biomediated process for removing contamination from a surface of a substrate, comprising: applying to a surface of a substrate an effective amount of a microorganism capable of microbial influenced degradation activity of said surface of said substrate, wherein the microorganism is encapsulated with a sufficient amount of at least one appropriate nutrient to effect degradation of said substrate to at least a selected depth; and maintaining the encapsulated microorganism on said surface for a time sufficient for microbial influenced degradation activity to degrade said substrate to at least a selected depth.

2. The process according to claim 1, wherein applying an effective amount of an encapsulated microorganism comprises applying an effective amount of an encapsulated form of a microorganism selected from the group consisting of acid-producing bacteria and fungi.

3. The process according to claim 2, wherein applying an effective amount of an encapsulated form of a microorganism comprises applying an effective amount of an encapsulated form of an acid-producing bacterium selected from the group consisting of an organic-acid-producing heterotrophic bacteria, nitrifying bacteria, sulfur oxidizing bacteria, and mixtures thereof.

4. The process according to claim 3, wherein applying an effective amount of an encapsulated form of an organic-acid-producing heterotrophic bacteria comprises applying an effective amount of an encapsulated form of an organic-acid producing heterotrophic bacteria that produces an organic acid selected from the group consisting of acetic, citric, formic, and lactic acids.

5. The process according to claim 3, wherein applying an effective amount of an encapsulated form of a nitrifying bacteria comprises applying an effective amount of an encapsulated form of a nitrifying bacteria selected form the group consisting of Nitrosomonas, Nitrobacter, and mixtures thereof.

6. The process according to claim 3, wherein applying an effective amount of an encapsulated form of a sulfur oxidizing bacteria comprises applying an effective amount of an encapsulated form of a sulfur oxidizing bacteria selected from the group consisting of Thiobacillus thiooxidans, Thiobacillus ferrooxidans, Thiobacillus neapolitanus, Thiobacillus intermedius, and mixtures thereof.

7. The process according to claim 2, wherein applying an effective amount of an encapsulated form of a microorganism comprises applying an effective amount of an encapsulated form of an organic-acid-producing heterotrophic fungus.

9. The process according to claim 1, wherein applying an effective amount of an encapsulated form of an encapsulated microorganism comprises applying an effective amount of an encapsulated microorganism that is passively supplied with moisture.

10. The process according to claim 1, further comprising providing an encapsulated microorganism for applying to said surface by combining a microorganism with an encapsulation material.

11. The process according to claim 10, wherein combining a microorganism with an encapsulation material comprises combining said microorganism with a polymeric binder material.

13. The process according to claim 1, wherein applying an effective amount of an encapsulated microorganism capable of microbial influenced degradation activity on said surface of a substrate comprises applying an effective amount of said encapsulated microorganism to a surface of a cementitious material.

14. The process according to claim 13, wherein applying an effective amount of said encapsulated microorganism to a surface of a cementitious material comprises applying an effective amount of said encapsulated microorganism to concrete.

15. The process according to claim 14, wherein applying an effective amount of said encapsulated microorganism to concrete comprises applying an effective amount of said encapsulated microorganism to a hot cell, pond, canal, sump, biological shield, room, floor, wall, or storage tank.

16. The process according to claim 1, wherein applying an effective amount of an encapsulated microorganism capable of microbial influenced degradation activity on said surface of a substrate comprises applying an effective amount of said encapsulated microorganism to a surface contaminated by a radionuclide.

17. The process according to claim 1, wherein maintaining the encapsulated microorganism on said surface for a time sufficient for microbial influenced degradation activity to degrade said substrate to a selected depth comprises maintaining the encapsulated microorganism on said surface for a time sufficient for microbial influenced degradation activity to degrade said surface to a depth of up to about 4 mm.

18. The process according to claim 1, wherein maintaining the encapsulated microorganism on said surface for a time sufficient for microbial influenced degradation activity to degrade said substrate produces a degraded layer.

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☐ 1. Document ID: US 20030027241 A1

L14: Entry 1 of 52 File: PGPB Feb 6, 2003

PGPUB-DOCUMENT-NUMBER: 20030027241
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030027241 A1

TITLE: BIOLUMINESCENT BIOSENSOR DEVICE

PUBLICATION-DATE: February 6, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Sayler, Gary S.	Blaine	TN	US	
Ripp, Steven A.	Knoxville	TN	US	
Applegate, Bruce M.	West Lafayette	IN	US	

US-CL-CURRENT: 435/29; 356/246, 422/50, 422/55, 422/58, 435/235.1, 435/320.1, 435/34, 435/832, 435/842, 435/848, 435/863 , 435/873, 435/879, 435/882, 435/885, 435/909, 436/535, 536/23.7

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 2. Document ID: US 20020132312 A1

L14: Entry 2 of 52 File: PGPB Sep 19, 2002

PGPUB-DOCUMENT-NUMBER: 20020132312
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020132312 A1

TITLE: Gas vesicles of cells and methods of harvesting, isolating and modifying same

PUBLICATION-DATE: September 19, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Ju, Lu-Kwang	Akron	OH	US	
Sundararajan, Anand	Lexington	KY	US	
Kashyap, Sunil	Salinas	CA	US	

US-CL-CURRENT: 435/136; 435/155, 435/168

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 3. Document ID: US 20020098574 A1

L14: Entry 3 of 52 File: PGPB Jul 25, 2002

PGPUB-DOCUMENT-NUMBER: 20020098574
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020098574 A1

TITLE: Microbes and methods for remediation

PUBLICATION-DATE: July 25, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
McTavish, Hugh	Birchwood	MN	US	

US-CL-CURRENT: 435/262.5

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 4. Document ID: US 20020068356 A1

L14: Entry 4 of 52 File: PGPB Jun 6, 2002

PGPUB-DOCUMENT-NUMBER: 20020068356
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020068356 A1

TITLE: METHOD OF REMOVING GAS FROM A SITE USING GAS VESICLES OF CELLS

PUBLICATION-DATE: June 6, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Ju, Lu-Kwang	Akron	OH	US	
Sundararajan, Anand	Lexington	KY	US	
Kashyap, Sunil	Salinas	CA	US	

US-CL-CURRENT: 435/262; 435/243

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 5. Document ID: US 20020048807 A1

L14: Entry 5 of 52 File: PGPB Apr 25, 2002

PGPUB-DOCUMENT-NUMBER: 20020048807
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020048807 A1

TITLE: HYDROCARBON SPILLAGE ABSORBING AND BIOREMEDIATING DEVICE AND METHOD

PUBLICATION-DATE: April 25, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
LEHR, WILLIAM F.	GREENVILLE	SC	US	

US-CL-CURRENT: 435/262.5; 435/281, 435/283.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 6. Document ID: US 20020034757 A1

L14: Entry 6 of 52 File: PGPB Mar 21, 2002

PGPUB-DOCUMENT-NUMBER: 20020034757
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020034757 A1

TITLE: Single-molecule selection methods and compositions therefrom

PUBLICATION-DATE: March 21, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
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US-CL-CURRENT: 435/6; 435/91.2, 536/22.1, 536/23.1, 536/24.3

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☐ 7. Document ID: US 20020031771 A1

L14: Entry 7 of 52 File: PGPB Mar 14, 2002

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TITLE: Sequence based screening

PUBLICATION-DATE: March 14, 2002

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US-CL-CURRENT: 435/6; 702/20

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

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L14: Entry 8 of 52 File: PGPB Dec 6, 2001

PGPUB-DOCUMENT-NUMBER: 20010049104
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DOCUMENT-IDENTIFIER: US 20010049104 A1

TITLE: Methods for modulating cellular and organismal phenotypes

PUBLICATION-DATE: December 6, 2001

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US-CL-CURRENT: 435/6; 435/455

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 9. Document ID: US 6423533 B1

L14: Entry 9 of 52 File: USPT Jul 23, 2002

US-PAT-NO: 6423533
DOCUMENT-IDENTIFIER: US 6423533 B1

TITLE: Isolation and use of perchlorate and nitrate reducing bacteria

DATE-ISSUED: July 23, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
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US-CL-CURRENT: 435/262.5; 210/610, 210/611, 435/252.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 10. Document ID: US 6413763 B1

L14: Entry 10 of 52 File: USPT Jul 2, 2002

US-PAT-NO: 6413763
DOCUMENT-IDENTIFIER: US 6413763 B1

TITLE: Method of removing gas from a site using gas vesicles of cells

DATE-ISSUED: July 2, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
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US-CL-CURRENT: 435/243; 424/450, 424/451, 424/455, 424/9.52, 435/252.1, 435/253.6, 435/317.1, 435/325, 435/41, 435/822, 435/832, 435/946

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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L14: Entry 20 of 52 File: USPT Mar 20, 2001

DOCUMENT-IDENTIFIER: US 6204049 B1
TITLE: Fungal compositions for bioremediation

Abstract Text (1):
Compositions and methods for bioremediation of sites contaminated with chemical pollutants, wherein survival and colonization of a polluted medium by a fungal microorganism having the capacity to degrade a chemical pollutant is enhanced; and microorganisms having the capacity to degrade one or more priority pollutants.

Brief Summary Text (4):
The invention also relates to compositions for remediating an environment or site which has been contaminated with a chemical pollutant, and to methods for delivering microorganisms in combination with a carrier for the microorganisms to an environment or site which has been contaminated with a chemical pollutant and which is subject to bioremediation. Methods are presented for delivering nutrients in combination with a carrier for the nutrients to an environment or site which has been contaminated with a chemical pollutant and which is subject to bioremediation, as are methods for delivering nutrients in combination with a microorganism and a carrier to an environment or site which has been contaminated with a chemical pollutant and which is subject to bioremediation.

Brief Summary Text (5):
Embodiments of the invention are presented relating to the biodegradation of benzo[a]pyrene, and to the fungus Marasmiellus troyanus. In particular, Marasmiellus troyanus isolate no. 216-1867 is presented, and compositions comprising M. troyanus isolate no. 216-1867 in combination with a carrier are presented. Yet further, the invention relates to the degradation of benzo[a]pyrene by M. troyanus, and the mineralization of benzo[a]pyrene by M. troyanus. A process for bioremediation of polluted media contaminated with benzo[a]pyrene is also shown.

Brief Summary Text (7):
Chemical pollution of various media (e.g. soil, water) is a common problem worldwide which has a major economic impact at the local, national, and global levels. The remediation of sites polluted or contaminated with toxic chemicals or hazardous wastes using existing technologies is generally extremely costly, laborious and time-consuming. For example, in the U.S., Congress established a multibillion dollar fund (the Superfund) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 1986 and 1990 (commonly known as the Superfund Act). The fund was established to pay for cleanup of polluted sites such as hazardous and municipal waste dumps, contaminated factories and mines, and leaking underground fuel storage tanks. During the eleven years between its inception and 1991, 30,000 potential Superfund sites were surveyed. The time required for cleanup of a Superfund site by the EPA has been as long as 10 years. Remediation efforts at hazardous waste sites have been partially effective 54% of the time and completely effective only 16% of the time (Riser-Roberts, E., (1992) "Bioremediation of Petroleum Contaminated Sites," pp. 1-34, CRC Press, Boca Raton, Fla.). Currently, additional sites of chemical pollution are being discovered and new sites of pollution are being created worldwide.

Brief Summary Text (9):
Improved technologies for remediation of polluted soil and water are urgently needed. Traditional methods for cleanup of contaminated soil has generally involved

excavation of the soil, followed by treatment or containment. Currently used techniques for remediating polluted soils include, for example, the physical removal of volatile materials by aspiration (vacuum extraction) and the incineration of contaminated soil. Because of the large volumes of soil usually involved, physicochemical methods such as those exemplified above may be prohibitively expensive. An alternative approach to cleaning up sites of chemical pollution is bioremediation, in which a biological organism is used as an agent for converting the chemical pollutant to less toxic or nontoxic compounds. For example, various microorganisms have been found to detoxify a number of toxic chemical pollutants (see, for example, G. Chaudry (Ed.) "Biological degradation & bioremediation of toxic chemicals," Dioscorides Press, Portland, Oreg., 1984). Biodegradation or detoxification of chemical pollutants is normally the result of one or more enzymatic reactions, including oxidation, reduction, hydrolysis, and conjugation (see, for example, D. W. Connell, & G. J. Miller, (1984) "Chemistry & Ecotoxicology of Pollution," pp. 1-48 & 231-247, John Wiley & Sons, Inc., New York, N.Y.).

Brief Summary Text (10):
One factor limiting the efficacy of prior art bioremediation processes is the tendency of microorganisms to lose viability and decline in number following their introduction to the remediation site. It has been demonstrated by numerous field trials that, in general, microorganisms released into the soil tend not to spread from the point of application, and further that their numbers tend to decline over time (see, for example, J. D. van Elsas, & C. E. Heijnen, "Methods for the introduction of bacteria into the soil: A review," Biol. Fertil. Soils, 10:127-133, 1990). Factors militating against the propagation and survival of microorganisms introduced into soils include: competition with other organisms for nutrients, water and space; parasitism, antibiosis and predation by other organisms; and unfavorable physicochemical parameters of the soil milieu, including sub-optimal pH, water and oxygen concentrations. In the case of polluted soils, problems associated with survival and propagation of microorganisms introduced into such soil may be exacerbated by the presence of toxic pollutants at concentrations which are inimical to microbial growth.

Brief Summary Text (14):
As mentioned above, in numerous field trials microorganisms have been released into the soil but their survival has been limited and their effectiveness poor due to the complex interactions and harsh conditions within the soil environment (J. D. van Elsas, & C. E. Heijnen, "Methods for the introduction of bacteria into the soil: A review," Biol. Fertil. Soils, 10:127-133, 1990). Techniques for in situ bioremediation of polluted soil can profit from lessons learned in nitrification, biocontrol, and other areas of applied microbiology in which living microorganisms are introduced into the environment. For example, to address the problems of lack of survival and effectiveness, microorganisms have been formulated with various carriers and encapsulating agents, and the formulations applied to the particular environment with varying results. One such carrier or encapsulating agent that has been used to encapsulate various fungi is alginate, a naturally occurring .beta.-1,4-linked copolymer of .alpha.-L-glucuronate and .beta.-D-mannuronate. Alginate gel is non-toxic and biodegradable, making alginate gel beads well-suited as vehicles for the release of microorganisms, nutrients, etc., into the environment.

Brief Summary Text (19):
None of the patents cited above, alone or in combination, teaches formulation of microorganisms having the capacity to degrade chemical pollutants, or the use of such organisms for bioremediation. Furthermore, the use of wheat bran in a fungal inoculum formulation, as taught by the process of Lewis et al., is not suitable for some fungi. Thus, we have found that the white rot fungus Phanerochaete chrysosporium formulated with wheat bran did not yield growth of the fungus after the wheat bran-formulated fungus was plated on a nutrient medium. Moreover, our subsequent studies have demonstrated that wheat bran, as well as other wheat products including purified wheat gluten, actually caused inhibition of growth of P. chrysosporium growing from alginate gel beads formulated without wheat bran. On the other hand, inhibition of growth of P. chrysosporium or other fungi has not been observed when sawdust, corncob grits, Pyrax clay or any other non-wheat based materials were used to formulate fungal inoculum according to the instant invention.

Brief Summary Text (20):
Connick, Jr. discloses in U.S. Pat. Nos. 4,401,456 and 4,400,391 processes for the incorporation of biocidal chemical compounds, such as insecticides and herbicides, into alginate gels. Certain biocidal compounds, e.g. some pesticides, are known as environmental pollutants and as such are potentially subject to various bioremediation techniques, including the techniques disclosed herein. U.S. Pat. Nos. 4,401,456 and 4,400,391 do not teach the encapsulation of fungi or other organisms.

Brief Summary Text (21):
Mitchell, in U.S. Pat. No. 3,649,239 teaches formulations of fertilizers, either as solutions or emulsions, in combination with alginate for the purpose of slow release of fertilizer to soil. U.S. Pat. No. 3,649,239 does not teach formulation of microbial inoculum, nor encapsulation of fungi or of other organisms.

Brief Summary Text (24):
Matsumura et al., U.S. Pat. No. 5,342,779 discloses the use of Phanerochaete chrysosporium for the degradation of halogenated organic compounds in a polluted medium by contacting the medium with the fungus, and simultaneously exposing the medium to ultraviolet radiation. Matsumura et al. do not teach the encapsulation of a microorganism with a carrier, vehicle or gelling agent.

Brief Summary Text (25):
Komatsu et al., EP publication No. 0646642 A2, discloses a microorganism (bacteria) in combination with a carrier and an inducer of a degradative enzyme, in which the microorganism is adsorbed on a surface of a carrier or on a surface of a water-absorbent polymer, and the microorganism and the carrier form an integral unit in that the microorganism remains in permanent association with the carrier. Thus, Komatsu et al. do not teach encapsulation of microorganisms with a carrier wherein the microorganism grows from the carrier and propagates itself within the medium in the absence of the carrier.

Brief Summary Text (26):
None of the patents or publications cited above teach the application of a microorganism formulated as an alginate bead to contaminated soil or to any other medium having toxic chemical pollutants therein, wherein the organism can remain viable within the alginate bead carrier for an extended period of time following application to the polluted medium; and the organism may grow away from the alginate bead carrier into the surrounding polluted medium and propagate itself, in the absence of the carrier, within the polluted medium; thereby the organism effectively colonizes the polluted medium into which the alginate bead formulation of the organism was introduced. Indeed, the ability to maintain a viable culture within the soil environment for a long enough duration, and in proximity to the target pollutant(s), has been the limiting factor in most bioremediation applications to date.

Brief Summary Text (27):
The degradation of toxic pollutants by many microorganisms, and particularly by bacteria, requires the pollutant to be not only in contact with or proximate to the microorganism, but also to be taken up by the cell where it can interact with intracellular degradative enzyme(s). White rot fungi, on the other hand, can perform this remedial function by the release of extracellular enzymes, such as ligninases. The mechanisms of enzymic degradation exhibited by many lignicolous microorganisms are non-specific and non-stereo selective, thereby increasing the metabolic versatility of such organisms and making them highly advantageous for bioremediation of sites contaminated with various pollutants. Likewise the considerable latitude in formulating degradative organisms as disclosed herein, increases the likelihood that any given degradative microorganism will have the ability to survive within, and colonize, a particular polluted medium subject to remediation.

Brief Summary Text (28):
Although to date, the majority of microorganisms used for bioremediation have been bacteria (prokaryotes), fungi (eukaryotes) are also potentially valuable in this regard. For example, in vitro laboratory studies with the lignolytic white rot

fungi, such as Phanerochaete chrysosporium, have shown the ability of these fungi to degrade a range of toxic compounds including polychlorinated biphenyls (PCBs), chlorinated pesticides, polyaromatic hydrocarbons, such as benzo[a]pyrene, pyrene, phenanthrene, fluorene, and nitroaromatic compounds (e.g. trinitrotoluene, TNT). D. P. Barr & S. D. Aust "Mechanisms white rot fungi use to degrade pollutants," Environmental Science Technology 28:78A-87A, 1994; J. A. Bumpus et al. "Oxidation of persistent environmental pollutants by a white rot fungus," Science 220:1434-1438, 1985. The ability of Phanerochaete spp. to degrade a range of structurally unrelated compounds has been ascribed largely to their lignolytic metabolic activity (S. D. Aust "Degradation of environmental pollutants by. Phanerochaete chrysosporium," Microbial Ecology, 20:197-209, 1990).

Brief Summary Text (29):
Despite the ability of P. chrysosporium and other lignolytic fungi to degrade numerous toxic pollutants, there has been little commercial success in applying these organisms to bioremediation. A major factor limiting the use of P. chrysosporium in bioremediation is the difficulty of introducing inoculum of the fungus to a contaminated medium in a manner that enables the fungus to grow and propagate within the medium. However, P. chrysosporium is not alone in this regard. On the contrary, it is normally problematic to establish recently-introduced microorganisms in a medium having an established indigenous microflora. The compositions and methods of the instant invention are designed to overcome the difficulty of establishing an introduced microorganism in such a medium, and to allow the successful use of a number of potentially valuable degradative organisms in bioremediation.

Brief Summary Text (39):
It is a further object of the instant invention to provide a method of preparing inoculum of a microorganism in combination with a carrier material wherein the microorganism is encapsulated within the carrier material.

Brief Summary Text (67):
Another feature of the invention is that it provides a composition comprising viable inoculum of a microorganism having the capacity to degrade a chemical pollutant in combination with one or more nutrients for the microorganism, in which the microorganism and the one or more of the nutrients are encapsulated within a carrier material.

Brief Summary Text (75):
Another feature of the invention is that it provides a method of formulating viable inoculum of a microorganism having the capacity to degrade a chemical pollutant in combination with one or more nutrients for the microorganism, in which the microorganism and one or more of the nutrients are encapsulated within a carrier material.

Brief Summary Text (85):
One advantage of the invention is that inoculum of a microorganism having the capacity to degrade a chemical pollutant can be preserved for subsequent use in bioremediation.

Brief Summary Text (87):
Another advantage of the invention is that when encapsulated within a suitable carrier material, a microorganism having the capacity to degrade a chemical pollutant may remain dormant for an extended period of time in the presence of one or more nutrients for the microorganism.

Brief Summary Text (88):
Another advantage of the invention is that when encapsulated within a suitable carrier material, a microorganism having the capacity to degrade a chemical pollutant and which has remained dormant for an extended period of time in the presence of one or more nutrients for the microorganism may become metabolically active by exposing the carrier material to moisture.

Brief Summary Text (89):
Another advantage of the invention is that a microorganism encapsulated within a

carrier material, and introduced into a polluted medium, may grow from the carrier material and propagate itself within the polluted medium in the absence of a carrier material.

Brief Summary Text (90):
Another advantage of the invention is that inoculum of a microorganism having the capacity to degrade a chemical pollutant can be encapsulated within a carrier material in combination with one or more nutrients for the microorganism, wherein the one or more nutrients are available to the encapsulated microorganism but are either unavailable or less available to other non-encapsulated microorganisms.

Brief Summary Text (96):
Another advantage of the invention is that a pure culture of M. troyanus having the capacity to degrade benzo[a]pyrene can be encapsulated within a carrier material in combination with one or more nutrients for the M. troyanus,. wherein the one or more nutrients are available to the encapsulated M. troyanus but are either unavailable or less available to other non-encapsulated microorganisms.

Brief Summary Text (101):
These and other objects, advantages, and features of the present invention are accomplished by the provision of a composition comprising a microorganism having the capacity to degrade a chemical pollutant in combination with a source of one or more nutrients for the microorganism, wherein the microorganism and the source of one or more nutrients are encapsulated within a carrier material, and the one or more nutrients are available to the encapsulated microorganism but are either unavailable or less available to other non-encapsulated organisms.

Brief Summary Text (102):
These and other objects, advantages and features of the present invention are accomplished by the provision of a composition comprising a microorganism having the capacity to degrade a chemical pollutant, in which the microorganism is encapsulated within a carrier material when introduced into a polluted medium having an indigenous microflora; and the microorganism further has the capacity to subsequently grow to the perimeter of the encapsulating material, to sporulate thereat, and to release spores which are able to germinate, thereby propagating the microorganism in the medium and external to the encapsulating carrier material.

Detailed Description Text (2):
The key role of many species of microorganisms in enacting biogeochemical change has long been recognized. For example, bacteria and fungi are the primary agents in the decomposition of waste materials and the remains of other organisms, and as such are of vital importance in the cycling of matter. Thus in the carbon cycle, organic compounds are subjected to oxidative catabolism by the combined metabolic activity of the microflora in the environment, eventually leading to the conversion of organic carbon to carbon dioxide. Many aerobic bacteria and fungi are capable of utilizing common components of other organisms (such as various lipids, carbohydrates, and proteins) as a source of carbon and energy thereby bringing about the decomposition of these materials. Only certain specialized microorganisms, however, are capable of decomposing more exotic organic compounds, including toxic naturally occurring compounds and chemically complex xenobiotics (see, for example, M. Alexander, "Biodegradation of chemicals of environmental concern," Science 211:132-138, 1981; G. Chaudry (Ed.) "Biological degradation & bioremediation of toxic chemicals," Dioscorides Press, Portland, Oreg., 1994).

Detailed Description Text (3):
Bioremediation is a process for environmental cleanup in which microorganisms, which may be either indigenous or introduced, are responsible for the removal or decomposition or degradation of chemical pollutants from contaminated sites. Microorganisms used for bioremediation are often highly specialized metabolically. The decomposition of chemical pollutants by a given microorganism is normally a function of its specific complement of degradative or catabolic enzymes, which in turn is a reflection of the phenotype and genotype of the microorganism.

Detailed Description Text (4):
Microorganisms having the capacity to detoxify, decompose or degrade chemical

pollutants and which may be used in bioremediation of a polluted site, may be isolated elsewhere and be subsequently introduced to the polluted site, or they may already be present at the polluted site at relatively low levels and/or be present in a metabolically inactive state. Such microorganisms may be collectively referred to, in general terms, as degradative microorganisms. Degradative microorganisms, which have been isolated from the polluted site or obtained elsewhere, may be used in their native form (i.e. without attempting to change their metabolic characteristics), or they may be changed phenotypically and/or genotypically, in order to increase their effectiveness, prior to their use in bioremediation. Thus, microorganisms deemed potentially useful as agents of bioremediation may undergo enrichment culture in the presence of a chemical pollutant, or in the presence of an analogue of a chemical pollutant, or the microorganisms may undergo mutation, for example by exposure to a known mutagen, or the microorganisms may be genetically manipulated using various recombinant DNA techniques (see, for example, T. Maniatis et al., Molecular Cloning: A Laboratory Manual, 1982, Cold Spring Harbor Lab, Cold Spring Harbor, N.Y.)

Detailed Description Text (6):
The process of bioremediation offers the potential of a cost-effective and environmentally benign method of cleaning up the many sites worldwide which are contaminated by chemical pollutants. In some cases, bioremediation results in mineralization of a chemical pollutant, that is, the complete degradation of a pollutant to yield water and carbon dioxide (see, for example, M. Alexander "Biodegradation of chemicals of environmental concern," Science 211:132-138, 1981; J. A. Bumpus (1990) "Microbial degradation of environmentally persistent organopollutants: recent progress and future promise," In: Biotechnology and Biodegradation, D. Kamely et al. (eds.) Portfolio Pub. Co., Woodlands, Tex., pp. 59-84; M. A. Providenti et al. "Selected factors limiting the microbial degradation of recalcitrant compounds," Journal of Industrial Microbiology 12:379-395, 1993).

Detailed Description Text (7):
Chemical pollutants which have been successfully treated by bioremediation include benzene, toluene, and xylene (BTX aromatics); certain pesticides; and explosives. G. Chaudry (Ed.) "Biological degradation & bioremediation of toxic chemicals," Dioscorides Press, Portland, Oreg., 1994). However, a common factor which tends to limit the efficacy of currently used bioremediation processes is the diminution in numbers of the introduced degradative microorganisms over time. Furthermore, in order to accomplish efficient remediation, the degradative organism should preferably propagate itself and effectively colonize the polluted medium. Thus, a major obstacle to effective bioremediation using prior art techniques is the delivery of inoculum of a particular microorganism capable of degrading a pollutant to a contaminated site such that the microorganism not only survives but also propagates itself within the contaminated medium.

Detailed Description Text (8):
The majority of microorganisms used for bioremediation are bacteria (i.e. prokaryotes, mostly unicellular). D. D. Hale, et al., "Biodegradation of chlorinated homocyclic and heterocyclic compounds in anaerobic environments," in Biological degradation and bioremediation of toxic chemicals, Ed. G. Chaudry, Dioscorides Press, Portland, Oreg., 1994; R. M. Atlas, et al., "Bioremediation of petroleum pollutants. Diversity & environmental aspects of hydrocarbon degradation," Bioscience, 45:332-339, 1995. However, a number of fungi (i.e. eukaryotes, mostly multicellular) are also capable of degrading complex organic compounds, and are potentially valuable as agents for effecting bioremediation. Indeed, fungi which secrete extracellular degradative enzymes have the advantage of having the capacity to degrade a toxic chemical pollutant without being directly exposed to the toxin, exposure to which may adversely affect growth and metabolism. In contrast, bacterial enzymes are predominantly intracellular, and therefore degradation of a toxic chemical pollutant by bacteria ordinarily requires the pollutant to enter the bacterial cell where it has the potential to inhibit growth and metabolism. Moreover, extracellular enzymes of fungi have the potential to degrade compounds with low solubility, and compounds which cannot enter cells. Thus, although some bacteria are efficient degraders of low molecular weight hydrocarbons, higher molecular weight hydrocarbons are generally not degraded efficiently by bacteria, whereas several fungi do show the ability to degrade higher molecular weight

hydrocarbons.

Detailed Description Text (9):
Another advantage of fungi as agents for bioremediation is their growth habit as thread-like hyphae and their multicellularity which allows them to penetrate and colonize substrates. Finally, fungi generally exhibit lower substrate specificity, as compared with bacteria, in the degradation of complex organic compounds. This lower substrate specificity of fungi has the potential for the degradation of a plurality of different chemical pollutants, either at the same site or at different sites, with the same fungal species or strain.

Detailed Description Text (10):
Lignin is an important component of the cell walls of vascular plants as a constituent of cell walls of xylem, roots, fruits, buds, bark, and cork. Apart from its role in the formation of supporting and conducting tissues, lignin serves to protect other plant components from chemical, physical, and biological attack. Thus, lignin resists degradation by most microorganisms but is degraded by specialized lignicolous microbes. Lignin represents a class of high molecular weight polymers, comprising monomers of a phenylpropane residue. There are several structural variations of the phenylpropane residue, and numerous ways in which they can be linked together. Further, the polymerization process occurs randomly. Therefore there exists great diversity in the structure of lignin molecules, to the extent that each lignin molecule may in fact be unique. This chemical diversity of lignin explains the non-specific and non-stereo selective nature of lignolytic enzymic activity exhibited by many lignolytic microorganisms. In turn, the capacity of these organisms for non-specific degradation of complex ring compounds signals the potential of lignolytic microorganisms, as a group, for bioremediation of a broad range of pollutants.

Detailed Description Text (11):
One of many fungi having potential as an agent for bioremediation is the white rot fungus Phanerochaete chrysosporium. This fungus, a natural inhabitant of forest ecosystems where it occurs on dead or decaying wood, possesses powerful lignolytic enzymic activity. As noted above, P. chrysosporium has the ability to degrade a number of toxic chemicals, including several common pollutants of the soil (T. Fernando & S. Aust, "Biodegradation of toxic chemicals by white rot fungi," in Biological degradation and bioremediation of toxic chemicals, pp. 386-400, Ed. G. P. Chaudry, Dioscorides Press, Portland, Oreg., 1994; A. Bumpus, et al. "Oxidation of persistent environmental pollutants by a white rot fungus," Science 220:1434-1438, 1985. Additionally, P. chrysosporium possesses extracellular enzymes which are secreted from the fungal hyphae and are free to diffuse into the medium in advance of the hyphae, thereby allowing for degradation of toxic compounds at sites some distance from the fungal cells, and at the same time the fungus is bestowed with increased tolerance to toxic compounds which are subject to degradation. Furthermore, the ligninase enzymic system of white rot fungi does not require substrate or substrate analogues for induction. Consequently, white rot fungi may not require acclimation to a chemical pollutant, nor a lag period after exposure to a pollutant, in order for degradation of the chemical pollutant to commence.

Detailed Description Text (12):
Despite the potential of P. chrysosporium as a bioremediation agent, it has proved difficult using conventional or prior art methods to formulate inoculum of the fungus in such a way that the fungus will establish a population which is sufficiently active and long-lived to be effective in remediating a polluted site. Compositions and methods of the instant invention are disclosed as valuable tools in overcoming this drawback.

Detailed Description Text (13):
Other than P. chrysosporium, numerous other microorganisms have the capacity to degrade various chemical pollutants and may be used in conjunction with the instant invention for the purpose of bioremediation. Four organisms which have potential as agents of bioremediation, and their source, are listed in Table 1. A preferred organism for bioremediation, under the invention is M. troyanus strain no. 216-1867. However, recitation of the above organisms or those listed in Table 1 should not be construed as limiting the invention in any way; rather attention is drawn to the

claims appended hereto which serve to define the scope of the invention.

Detailed Description Text (14):
The instant invention is concerned with compositions comprising inoculum of microorganisms useful as agents for bioremediation and methods for formulating such compositions. The instant invention is also concerned with compositions comprising a source of one or more nutrients in combination with one or more carrier materials for facilitating bioremediation and methods for formulating such compositions. The instant invention is also concerned with methods of performing or facilitating bioremediation using the compositions and methods of the instant invention.

Detailed Description Text (15):
A degradative microorganism may be combined with various carriers by mixing a preparation of the microorganism with the carrier material in various ratios to form a more or less homogeneous amorphous mixture. Such a mixture may take the form of a suspension, a paste or the like, depending on the particular carrier and microorganism and the ratios used. Alternatively, the combination of a degradative microorganism with a carrier material may be such that the microorganism is encapsulated by, or enclosed within, the carrier material. In the latter case, encapsulating material may be in a variety of shapes, including more or less flat layers or sheets and spheroidal pellets or beads. In addition, encapsulating materials in combination with a microorganism may be formed in specific ranges of size. The particular shape and size of the encapsulating material will depend on factors such as the nature of the microorganism, the composition of the carrier material, and the intended applications. A broad range of materials may be used as carriers, e.g. silica, peat, certain cereal grains or grain products, water-insoluble gels, and various clays or clay-like materials. Carrier materials may comprise mixtures of two or more of these or other materials. Furthermore, a given carrier material may be used to encapsulate two or more different species or strains of microorganisms in various combinations.

Detailed Description Text (16):
Compositions comprising formulations of microbial inoculum under the invention comprise a microorganism capable of degrading a chemical pollutant in combination with a suitable carrier material. Under the invention, compositions for bioremediation may comprise two or more different species or strains of microorganisms which are able to coexist or are compatible. The two or more different microorganisms may act more or less independently during bioremediation: each organism may itself independently degrade or decompose the same chemical pollutant, or each organism may itself independently degrade or decompose one or more different chemical pollutants present in the same contaminated medium. For example, organisms A and B may both independently degrade compound Y, or organism A may independently degrade compound Y, while organism B may independently degrade compounds W and Z. When each of two or more different compatible organisms degrade or decompose the same chemical pollutant, the biochemical mechanism of degradation or decomposition of the chemical pollutant by the different organisms may be the same or different. Alternatively, two or more different compatible microorganisms comprising a single bioremediation composition may act in concert to degrade a particular chemical pollutant, that is, the two or more different organisms may complement each other metabolically with respect to degradation of the pollutant. For example, a first microorganism of the bioremediation composition may metabolize a toxic chemical pollutant to one or more products, at least one of which may also be toxic. A second microorganism may then metabolize one or more of the metabolic products of the first microorganism.

Detailed Description Text (17):
In one embodiment of the invention, compositions further comprise one or more nutrients. Such nutrients may constitute the sole source of nutrients for the microorganism during a particular period prior to, or during, the bioremediation process, or they may represent nutrients which are supplementary to another source of nutrients. Nutrients to be supplied to a microorganism under the invention may be organic or inorganic, and may represent, for example: a source of energy, a source of carbon, a source of nitrogen, a source of phosphorus, a source of sulfur, a source of growth factors, a source of vitamins, a source of amino acids, a source of purine, a source of pyrimidine, a source of minerals, and a source of

micronutrients.

Detailed Description Text (19):
Microorganisms and/or nutrient(s) comprising compositions under the invention may be admixed with a carrier material to form initially an amorphous, more or less homogeneous mixture, which subsequently may be cut, rolled, extruded, etc. to produce various forms of the composition. Or, the microorganisms and/or nutrient(s) may be encapsulated within the carrier material to form a capsule. It will be clear to the skilled artisan that the specific shape and size of such capsules can be varied, depending on factors such as the nature of the encapsulated microorganism, the intended application of the encapsulated composition, ease of storage and handling, and the like. A preferred carrier material under the invention is a water-insoluble polymeric gel. A particularly preferred carrier is an alginate salt, and more preferably, calcium alginate.

Detailed Description Text (22):
Inoculum of a fungus comprising a composition for bioremediation may be prepared by growing the fungus on any liquid or solid culture medium which will support its growth. However, preferably the culture medium will be one which supports vigorous growth and, optionally, sporulation of the fungus. The composition of the culture medium, aeration rate, incubation temperature, etc. will depend on the particular fungus to be grown for production of inoculum. Those skilled in the art will readily appreciate how these parameters may be successfully manipulated to obtain a suitable source of fungal inoculum. After a suitable period of incubation, the fungus may be harvested by suspending it in either spent liquid medium in which the fungus has been grown or in a sterile liquid, to provide a suspension of fungal inoculum. The fungal inoculum may be in the form of a suspension of mycelial hyphae, spores, or other propagules; or in the form of a suspension comprising a combination of mycelium, spores, and other propagules. In the latter case, the mycelium, spores, and other propagules of the suspension may be separated from each other to provide different types of inoculum suspension prior to adjustment of the concentration of the inoculum. If mycelium is used for preparing the inoculum it may be blended or comminuted to provide a suspension of hyphal fragments. The concentration of the hyphal fragments, spores or other propagules in the suspension may be adjusted to the desired concentration range, normally expressed as colony forming units/ml (cfu/ml). The concentration of inoculum is preferably in the range of 10.sup.3 -10.sup.9 cfu/ml, more preferably in the range of 10.sup.5 -10.sup.8 cfu/ml.

Detailed Description Text (24):
A suspension of fungal inoculum prepared as described above is diluted with a slurry of a water soluble salt of alginic acid in water. A preferred salt of alginic acid under the invention is sodium alginate. The preferred water is distilled water or deionized water. Preferably, the suspension of fungal inoculum is diluted 1:3 (v/v) with a slurry of 0.7-2.5% sodium alginate (by weight) in deionized water to give a final sodium alginate concentration of 0.525-1.875% (by weight). More preferably, the final sodium alginate concentration is in the range of 0.75-1.5% (by weight). Most preferably the final sodium alginate concentration is in the range of 0.9-1.1% (by weight). The mixture may be amended by the addition of various inorganic or organic materials, including, for example, a source of at least one nutrient for the microorganism, and/or supplementary water absorbent materials or fillers such as clay, ground silica, sawdust, corncob grits, and the like. It is to be understood that certain carrier materials, as well as certain water absorbent materials or fillers can also serve as a direct source of at least one nutrient for the microorganism. That is to say, certain components of an inoculum composition under the invention may play a dual role as a source of at least one nutrient for the microorganism and as a supplementary water absorbent filler or carrier material. For example, a carrier material such as alginate gel may play a dual role as a vehicle or encapsulating agent for a microorganism and as a reservoir for the slow release of micronutrients required for the growth of microorganisms. In particular, the addition of suitable proportions of certain supplementary water absorbent materials to the fungal inoculum/sodium alginate mixture may serve to enhance survival of the microorganism within the carrier material, and may also promote establishment of the microorganism in the environment into which it has been introduced.

Detailed Description Text (34):

At each stage, phase, or level of colonization of a polluted medium by an introduced microorganism as referred to above, vegetative growth and/or propagules may produce one or more intracellular or extracellular degradative enzymes. The ability of an introduced fungus to propagate itself and colonize a polluted medium is necessary for an efficacious in situ bioremediation process, since contact of the mycelium, or extracellular enzymes emanating therefrom, with the pollutant is required for degradation of the pollutant; and, colonization of the polluted medium provides a larger area of mycelium and allows extracellular enzymes to contact a larger volume of pollutant.

Detailed Description Text (38):
According to one embodiment of the invention, compositions may comprise a source of one or more nutrients for a microorganism capable of degrading a chemical pollutant, and a carrier for the source of one or more nutrients. Such a composition may be added to a polluted medium which is subject to in situ bioremediation by one or more degradative microorganisms, where the composition may provide for the controlled release of one or more nutrients for use by one or more microorganisms over an extended period of time.

Detailed Description Text (39):
Apart from the introduction of microbial inoculum into a polluted medium, such as soil, other bioremediation technologies include bioreactors, land farming, and composting (see, for example, P. Morgan & R. J. Watkinson, "Hydrocarbon degradation in Soils and Methods for Soil Biotreatment," CRC Critical Reviews in Biotechnology 8:305-333, 1989). For example, bioreactors containing one or more different microorganisms having the capacity to degrade one or more pollutants may be used for the ex situ bioremediation of polluted groundwater, such as groundwater contaminated with hydrocarbons or other petroleum derived products. organic pollutants tend to accumulate in the upper layers of groundwater. Water from different layers of groundwater may be selectively pumped or otherwise removed from the ground, depending on the circumstances including the degree and nature of the contaminants, the capability of the degradative microorganism(s), the nature and capacity of the bioreactor, and the projected end-use of the remediated water. Contaminated water may be circulated through a bioreactor, at an appropriate rate, where removal or degradation of one or more pollutants is enacted by the resident microflora. Effluent from the bioreactor may be used directly, stored separately from the groundwater reservoir, or returned to deeper, less contaminated layers of groundwater.

Detailed Description Text (40):
Degradative microorganisms for use in bioreactors may be formulated in various ways in order to maintain their viability and metabolic activity. Compositions comprising degradative microorganisms and methods of making such compositions, under the invention, for use in bioreactors or other ex situ bioremediation processes may be performed essentially as described above in the context of in situ bioremediation of soil. A preferred formulation of degradative microorganisms for use in bioreactors under the invention is encapsulating alginate gel beads. A preferred microorganism for use in bioreactors under the invention is M. troyanus. A more preferred microorganism for use in bioreactors under the invention is M. troyanus strain no. 216-1867.

Detailed Description Text (101):
Although the invention has been described primarily with reference to formulation of fungi for the purposes of bioremediation, fungi formulated according to the invention may also be used as a convenient form of inoculum for introducing microorganisms into various environments for other purposes, including: composting, and as mushroom spawn. Fungi formulated according to the invention may also be used in drain cleaners and/or for other cleaning purposes, for cleaning grease and other such products. The fungi might even be used as an insect killing agent.

Current US Original Classification (1):
435/254.1

Current US Cross Reference Classification (2):
435/262

Current US Cross Reference Classification (3):
435/262.5

Other Reference Publication (6):
Trevors et al., "Use of alginate and other carriers for encapsulation of microbial cells for use in soil," Microbial Releases 1:61-69 (1992).

Other Reference Publication (8):
Atlas et al., "Bioremediation of petroleum pollutants. Diversity and environmental aspects of hydrocarbon degradation," Bioscience 45:332-339 (May 1995).

Other Reference Publication (25):
Fernando & Aust, "Biodegradation of toxic chemicals by white rot fungi," in Biological degradation and bioremediation of toxic chemicals, pp. 386-400, Ed. G. Chaudry, Dioscorides Press, Portland, OR (1994).

Other Reference Publication (31):
Hale et al., "Biodegradation of chlorinated homocyclic and heterocyclic compounds in anaerobic environments," in Biological degradation and bioremediation of toxic chemicals, Ed. G. Chaudry, Dioscorides Press, Portland, OR, (1994).

Other Reference Publication (36):
Levinson et al., "Hazardous waste cleanup and treatment with encapsulated or entrapped microorganisms," in Biological degradation and bioremediation of toxic chemicals, Ed. G. Chaudry, Dioscorides Press, Portland, OR, (1994), pp. 455-469.

Other Reference Publication (43):
Riser-Roberts, "Bioremediation of petroleum contaminated sites," pp. 1-34, CRC Press, Boca Raton, FL (1992).

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L14: Entry 27 of 52 File: USPT Apr 18, 2000

DOCUMENT-IDENTIFIER: US 6051411 A
TITLE: Microorganisms immobilized in chitosan crosslinked with lignosulphonate for purification of waste water

Abstract Text (1):
Microorganisms which may be in the form of homogenated anaerobic sludge are immobilized in a polymeric gel matrix containing chitosan and lignosulphonate. A mixture of chitosan solution and a microorganism is added dropwise to a solution of lignosulphonate to crosslink chitosan droplets and form beads of chitosan/lignosulphonate matrix membrane encapsulating the microorganism. Alternatively, the mixture is added to a water-insoluble organic phase to form chitosan beads in an emulsion, and to the emulsion is added a lignosulphonate solution to crosslink the beads and form a chitosan/lignosulphonate matrix membrane encapsulating the microorganism. In another embodiment, anaerobic bacteria in the form of granules are encapsulated in the chitosan/lignosulphonate matrix membrane and the membrane contains another bacterial specie(s). Waste water containing biodegradable polychlorinated aliphatic hydrocarbons is purified by contacting with microorganisms including anaerobic and methanotrophic species encapsulated in beads of the chitosan/lignosulphonate matrix membrane. Reductive dechlorination is effected by the anaerobic species and aerobic mineralization of intermediates is effected by the methanotrophic species which may produce methane monooxygenase.

Brief Summary Text (15):
According to another aspect of the invention, a method is provided for the purification of waste water containing biodegradable polychlorinated aliphatic hydrocarbons, comprising contacting the waste water with microorganisms capable of biodegrading such hydrocarbons, said microorganisms being encapsulated in beads at a chitosan/lignosulphonate matrix, whereby reductive dechlorination is effected by anaerobic species, and aerobic mineralization of intermediates is effected by methanotrophic species.

Detailed Description Text (10):
According to the first aspect of the invention, homogenized anaerobic sludge is mixed with a solution of chitosan(1-1.5% w/v) in a glacial acetic acid solution while maintaining a pH in the range of 4.0-5.0. The mixture is then added dropwise to an aqueous solution of lignosulphonate (8-12% w/v) preferably about 10% w/v, to form beads of the chitosan/lignosulphonate matrix encapsulating the bacteria, and stirred for 1-3 hours in order to harden the beads. During the dropwise addition of the chitosan/cells mixture the pH of the lignosulphonate solution is maintained at pH 7-8 by the addition of a suitable buffer e.g. tris buffer. After the beads harden for 1-3 hours, they are washed with distilled water.

Detailed Description Text (14):
Alternatively, anaerobic granules can be coated with chitosan which contains another bacterial specie(s). This is done by mixing granules, aqueous chitosan (1-1.5% w/v), and a third specie(s) and then dispersing this mixture (i.e. air sparging) in a solution of (8-12% w/v, preferably 10%, lignosulphonate. The end product is anaerobic granules coated with a chitosan/lignosulphonate matrix membrane encapsulating the other bacterial specie(s).

Detailed Description Text (27):
3. Guiot, S. R., Kuang, X., Beaulieu. C., Corriveau, A., Hawari, J. A. Anaerobic and

aerobic/anaerobic treatment for tetrachloroethylene(PCE). In: Bioremediation Series, Bioremediation of Chlorinated Solvents (Hinchee, R, Leeson, A and Semprini, L., eds.), Battelle Press, Columbus, Ohio, 1995, 3(4): 191-198

Current US Original Classification (1):
435/178

Current US Cross Reference Classification (1):
435/177

Current US Cross Reference Classification (2):
435/262.5

CLAIMS:

1. A method for the immobilization of a microorganism, comprising

(a) providing an aqueous solution of chitosan and an acid, wherein the concentration of chitosan is 1-1.5%/ w/v,

(b) adding a microorganism, to the solution, while maintaining the pH in a range of 4.0 to 5.0 to form a mixture,

(c) adding the mixture dropwise to an aqueous solution of lignosulphonate, wherein the concentration of lignosulphonate is 8-12% w/v, while maintaining the pH in the range of 7.0 to 8.0 by means of a buffer, to form beads of a chitosan/lignosulphonate matrix membrane encapsulating the microorganism, and

(d) stirring to harden the beads.

7. A method for the immobilization of a microorganism, comprising

(a) providing an aqueous solution of chitosan, wherein the concentration of chitosan is 1-1.5% w/v,

(b) adding a microorganism to form a mixture,

(c) adding the mixture to a non-toxic water-insoluble organic phase to form chitosan beads and stirring to form an emulsion, and

(d) adding to the emulsion formed in (c), an aqueous lignosulphonate solution, wherein the concentration of lignosulphonate solution is 8-12% w/v, to cross-link the beads and form a chitosan/lignosulphonate matrix membrane encapsulating the microorganism.

11. A method according to claim 7, wherein in step (b) the microorganism comprises anaerobic bacteria in the form of granules and another bacterial specie(s), and wherein step (d) includes air sparging, whereby the anaerobic granules are encapsulated in a chitosan/lignosulphonate matrix membrane and the other bacterial specie(s) is is contained in the membrane.

12. A method for the purification of waste water containing biodegradable polychlorinated aliphatic hydrocarbons, comprising

contacting the waste water with microorganisms including anaerobic and methanotrophic species capable of biodegrading such hydrocarbons, said microorganisms being encapsulated in beads of a chitosan/lignosulphonate matrix, whereby reductive dechlorination is effected by anaerobic species, and aerobic mineralization of intermediates is effected by methanotrophic species.

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L14: Entry 32 of 52 File: USPT Jan 26, 1999

DOCUMENT-IDENTIFIER: US 5863789 A
TITLE: Microorganism-holding carrier and method for remediation of soil employing the carrier

Brief Summary Text (10):
On the other hand, soil remediation utilizing a microorganism, namely bioremediation, is promising.

Brief Summary Text (11):
The bioremediation methods include strengthening of self-cleaning function of ecosystem by activating a native microorganism in the soil to decompose the polluting substance into an innoxious substance; and include also, as an improved method, intentional introduction of microorganism having the ability to decompose the polluting substance from the outside to accelerate the remediation of the polluted soil.

Brief Summary Text (17):
On the other hand, in addition to the improvement of survivability of the applied microorganism, the bioremediation involves another problem on efficiency of diffusion of the applied microorganism in the soil. The bioremediation is directed to a polluted land over a large area which contains a pollutant at a low concentration, and therefore cannot be treated by a physicochemical method such as vacuum extraction. To clean such soil practically, the decomposing microorganism is required to diffuse in the polluted soil. However, the microorganism cannot easily migrate in the soil. Therefore, a method needs to be developed for bringing the microorganism to the proximity to the polluting substance in the soil. Currently conducted methods include injection of a decomposing microorganism into soil by pressure of water or air, application of a large amount of a decomposing microorganism, and so forth. With such a method, however, the diffusion of the microorganism is extremely impeded in some kinds of soils such as soils of a high clay content or of a low water content. Therefore, an improved method is required.

Detailed Description Text (35):
The highly water-absorbent polymer does not absorb or supplies (gradually releases) water one-sidedly, but it can repeat cycles of absorption and gradual release in accordance with the water content of the soil. Therefore, a polluting substance in a low concentration in soil of low water content, which cannot be decomposed readily, can be decomposed acceleratedly in a following manner. A highly water-absorbent polymer holding a decomposition microorganism without water absorption is applied to polluted soil. To this soil, water or a culture medium is added in consideration of the water content of the soil. The added water or a culture medium into which a small amount of the polluting substance has come to be dissolved is gradually absorbed by the applied highly water-absorbent polymer and thereby is brought close to the decomposition microorganism. At this time, a part of the polluting substance is decomposed by the microorganism. As the water content of the soil, which had once increased by addition of the water or the culture medium, decreases with lapse of time, the absorbed water is gradually released from the highly water-absorbent polymer. In this step also, the polluting substance in the released solution is decomposed by the microorganism. After a certain time when the water content of the highly water-absorbent polymer has decreased, water or the culture medium is again added thereto. Thereby, still remaining small amount of the polluting substance is dissolved in the liquid, and the liquid is absorbed by the highly water-absorbent

polymer to decompose the substance by the microorganism in the same manner. By repetition of the steps, the soil containing a polluted substance at a low content and water at a low water content can be cleaned efficiently. This method, in contrast to conventional bioremediation which collects the polluting substance diffused in the soil, is characterized in that a polluting substance is transferred in the soil by utilizing the water absorbing power as the driving force to collect the polluting substance close to the decomposition microorganism. This method makes easy the cleaning of the soil in which a microorganism does not readily diffuse, e.g., soils of a high clay content. The addition of the water or the liquid culture may be conducted in a conventional manner.

Detailed Description Text (100):
In this Example, were employed Pseudomonas cepacia KK01 strain (FERM BP-4235) having TCE decomposition activity as the microorganism, phenol as the water-soluble inducer of biological-activity, and a polyacrylamide gel as the carrier and holder of the above microorganism and the inducer. The spherical microorganism-holding carrier coated with a bimolecular lipid film was used as the inducer-holder.

Current US Original Classification (1):
435/262

Current US Cross Reference Classification (1):
435/178

Current US Cross Reference Classification (2):
435/179

Current US Cross Reference Classification (3):
435/180

Current US Cross Reference Classification (4):
435/244

Current US Cross Reference Classification (5):
435/245

Current US Cross Reference Classification (6):
435/262.5

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L14: Entry 38 of 52 File: USPT Sep 15, 1998

DOCUMENT-IDENTIFIER: US 5807724 A
TITLE: Degradation of petroleum hydrocarbons with organisms encapsulated in wax

Brief Summary Text (9):
In my experiments I have found that of the 300+species of Candida, three particular species of the genus Candida lipolytica, more specifically, C. albicans; C. guilliermondii; and C. yarrowia, have performed exceedingly well in degrading sample oils in my laboratory. I selected and specified these particular species for claiming in my discovery, as they possess certain properties with regard to nutrient requirements (some require no nutrient; are aerobic or anerobic), possess the ability to produce lipase across a broad temperature range (>-10 F. to >+68 F.), and are capable of maintaining basal cellular activity in salt or fresh waters. Of course, other species and organisms of and not of the genus C. could and may also be used as a component in the bioremediation device, instant, and in that regard the examples cited above should be interpreted as being illustrative, rather than limiting.

Brief Summary Text (14):
Accordingly, the present invention provides encapsulated microbes or cryptobiotic microbes. The microbes possess the ability to produce chemical-degrading enzymes. Preferably, the microbes are capable of producing lipase (a hydrocarbon-degrading enzyme).

Brief Summary Text (18):
Preferably, the encapsulated microbes are contained in a buoyant container to act as a flotation device. Preferably, the container has affixed thereupon fastening means or mechanisms. An example of a suitable fastening means is a Velcro.RTM. fastening system. The fastening means may also comprise of a manufactured orifice, slot or receptacle or a curved protrusion. The fastening means enables attachment of two or more similar flotation devices. The present invention thus provides an efficient and convenient delivery system enabling use of a single encapsulated-microbe-containing flotation device or multiple fastened devices.

Current US Original Classification (1):
435/177

Current US Cross Reference Classification (2):
435/182

Current US Cross Reference Classification (3):
435/248

Current US Cross Reference Classification (4):
435/249

Current US Cross Reference Classification (5):
435/255.4

Current US Cross Reference Classification (6):
435/262.5

Current US Cross Reference Classification (7):

435/281

CLAIMS:

1. A bioremediation system for the remediation of a petroleum hydrocarbon on water, said bioremediation system comprising: a buoyant container, said buoyant container including therein a plurality of bioremediation devices, each of said bioremediation devices comprising an organism capable of producing a substance for degrading a petroleum hydrocarbon and a shell containing said organism, said shell consisting essentially of a wax.

13. A method for degrading a petroleum hydrocarbon comprising: placing a plurality bioremediation devices in contact with said petroleum hydrocarbon, each of said bioremediation devices comprising an organism capable of degrading said petroleum hydrocarbon and a shell containing said organism, said shell consisting essentially of a wax.

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L14: Entry 45 of 52 · File: USPT Mar 11, 1997

DOCUMENT-IDENTIFIER: US 5609667 A
TITLE: Process and material for bioremediation of hydrocarbon contaminated soils

Parent Case Text (2):
The present application is a continuation-in-part of Ser. No. 08/219,843 filed Mar. 30, 1994 entitled "Process and Material For Bioremediation of Hydrocarbon Contaminated Soils" and now abandoned.

Detailed Description Text (14):
In about eighty (80) days, the plant in the product of the invention started to sprout new growth. This phenomena raised a working hypothesis that there was microbial action or bioremediation in the soil, apparently contributed by microorganisms indigenous to the inventive adsorbent itself. The invention adsorbent is a cellulose derived from an oil bearing plant (cotton seeds). Cellulose from peanut hulls, rice hulls, corn cobs, soybeans or other oil-bearing plants is believed to have similar microbial and physical characteristics.

Detailed Description Text (15):
In a second test, a new plant was planted in the remaining samples of the diesel fuel contaminated material without additional moisture. The other three (3) plants died and the product of invention kept the plant alive but without growth. It was completely unexpected that one part of the contaminated dirt now grew a flower, and one part, even though sitting in the same room, did not support growth. As the only difference between the soils was the first set of material with the growing flower was kept damp during the time of the experiment. It appears that the moisture and oxygen to the soil enhanced the growth of indigenous bacteria, thus causing bioremediation of the soil. Soil without moisture did not start bacterial digestion of the hydrocarbon and remained dormant.

Detailed Description Text (23):
This product, comprising a powdery cellulose material with approximately 3-8% effective nitrogen bearing nutrient and trace phosphorus, supports the enhanced growth of indigenous microorganisms which are encapsulated in the cellulosic adsorbent. The cellulose is derived from oil-bearing plants (i.e. cotton seed) and is believed to have indigenous microorganisms that adapt readily to metabolize oils. The cellulose, when moistened, adsorbs and binds hydrocarbons; the nutrients rapidly develop large indignous bacterial populations which are active in the reduction of the adsorbed hydrocarbons to benign by-products, particularly water and carbon dioxide. In addition, the treated powdered cellulosic material has a particularly high absorption of hydrocarbons and, therefore, enhances the movement of the hydrocarbons from the soil into contact with the enhanced bacterial populations. The end result is a material which has a significantly greater effectiveness in the reduction of hydrocarbons within the soil and a significantly enhanced speed of reduction with minimum labor.

Current US Cross Reference Classification (1):
435/262

Set Name side by side	**Query**	**Hit Count**	**Set Name** result set
	DB=USPT,PGPB,JPAB,EPAB,DWPI; PLUR=YES; OP=ADJ		
L21	l16 and L20	30	L21
L20	L2.ti.	68253	L20
L19	l16 and L18	80	L19
L18	L2.ab.	172230	L18
L17	l1 and L16	0	L17
L16	l14 and L15	106	L16
L15	L2 near3 l3	28162	L15
L14	l12 and L13	180	L14
L13	L2 with l3	50900	L13
L12	L11 not l10	249	L12
L11	L2 same l8	249	L11
L10	L2 same l7	2	L10
L9	l7 and L8	8	L9
L8	l6 same l3	4400	L8
L7	l1 same L3	38	L7
L6	l4 with L5	61939	L6
L5	solid$9 or dewater$3	1718710	L5
L4	wastewater or sludge$1 or waste$1	609858	L4
L3	layer$4 or coat$4	3827928	L3
L2	granul$7	366579	L2
L1	biosolid$1 or (bio-solid$1)	307	L1

END OF SEARCH HISTORY

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Search Results - Record(s) 1 through 8 of 8 returned.

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1. Document ID: US 20010001454 A1

L9: Entry 1 of 8 File: PGPB May 24, 2001

PGPUB-DOCUMENT-NUMBER: 20010001454
PGPUB-FILING-TYPE: new-utility
DOCUMENT-IDENTIFIER: US 20010001454 A1

TITLE: Process for controlling foam in a treatment reactor

PUBLICATION-DATE: May 24, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Pressley, Richard L.	Crown Point	IN	US	
Williamson, Jeffrey D.	New Berlin	WI	US	

US-CL-CURRENT: 210/608; 210/194, 210/609, 210/613, 210/614, 210/629

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. Desc | Image

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2. Document ID: US 6283676 B1

L9: Entry 2 of 8 File: USPT Sep 4, 2001

US-PAT-NO: 6283676
DOCUMENT-IDENTIFIER: US 6283676 B1

TITLE: Sequential aerobic/anaerobic solid waste landfill operation

DATE-ISSUED: September 4, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hater; Gary R.	Hamilton County	OH		
Green; Roger	Hamilton County	OH		
Hamblin; Gerard	Ozaukee County	WI		

US-CL-CURRENT: 405/129.57; 210/747, 405/129.6, 405/129.7, 405/129.85

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw. Desc | Image

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☐ 3. Document ID: US 5989428 A

L9: Entry 3 of 8 File: USPT Nov 23, 1999

US-PAT-NO: 5989428
DOCUMENT-IDENTIFIER: US 5989428 A

TITLE: Controlling wastewater treatment by monitoring oxygen utilization rates

DATE-ISSUED: November 23, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Goronszy; Mervyn Charles	Lake Forest	CA	92630	

US-CL-CURRENT: 210/605; 210/143, 210/195.1, 210/607, 210/614, 210/626, 210/903, 210/921, 210/96.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☑ 4. Document ID: US 5862610 A

L9: Entry 4 of 8 File: USPT Jan 26, 1999

US-PAT-NO: 5862610
DOCUMENT-IDENTIFIER: US 5862610 A

TITLE: Method for coating dry pellets made of waste bio-solids with waste bio-solids

DATE-ISSUED: January 26, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lipert; Peter	Dollard des Ormeaux			CA

US-CL-CURRENT: 34/377; 34/376, 34/60, 435/262.5, 435/283.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 5. Document ID: US 5855664 A

L9: Entry 5 of 8 File: USPT Jan 5, 1999

US-PAT-NO: 5855664
DOCUMENT-IDENTIFIER: US 5855664 A

TITLE: Solid waste landfill cover material and method of extending the useful life of a solid waste disposal landfill

DATE-ISSUED: January 5, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Bielecki; Adam J.	Avon Park	FL		
Harrington; Robert	Sebring	FL		

US-CL-CURRENT: 405/129.9; 106/18.11, 106/18.13, 241/DIG.38, 404/82, 405/129.25, 405/129.45, 405/129.95, 405/271, 427/421

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 6. Document ID: US 5741346 A

L9: Entry 6 of 8 File: USPT Apr 21, 1998

US-PAT-NO: 5741346
DOCUMENT-IDENTIFIER: US 5741346 A

TITLE: Mineral and organic fertilizer

DATE-ISSUED: April 21, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Glover; Alexander S.	Winston-Salem	NC		

US-CL-CURRENT: 71/15; 71/20, 71/21, 71/63

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 7. Document ID: WO 200043129 A1 AU 9924805 A

L9: Entry 7 of 8 File: DWPI Jul 27, 2000

DERWENT-ACC-NO: 2000-499191
DERWENT-WEEK: 200055

TITLE: Method for treating waste bio-solids for fertilizers, involves reprocessing high density pellets in feed conveyor which is obtained from shaftless screw conveyor opening

INVENTOR: LIPPERT, P

PRIORITY-DATA: 1999WO-US01891 (January 25, 1999)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 200043129 A1	July 27, 2000	E	017	B05B015/00
AU 9924805 A	August 7, 2000		000	B05B015/00

INT-CL (IPC): B01 F 7/08; B05 B 15/00; C05 F 11/08

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Clip Img | Image

☐ 8. Document ID: US 5862610 A

L9: Entry 8 of 8 File: DWPI Jan 26, 1999

DERWENT-ACC-NO: 1999-130841
DERWENT-WEEK: 199913

TITLE: Coating of dry pellets made of waste bio-solids with waste bio-solids - by feeding pellets and wet sludge into an incline-adjustable shaft-less screw conveyor which feeds a dryer or oven

INVENTOR: LIPERT, P

PRIORITY-DATA: 1995US-0580338 (December 28, 1995)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 5862610 A	January 26, 1999		007	F26B007/00

INT-CL (IPC): B09 B 3/00; C12 M 1/00; F26 B 7/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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Terms	Documents
17 and L8	8

Display Format: - Change Format

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L9: Entry 1 of 8 File: PGPB May 24, 2001

DOCUMENT-IDENTIFIER: US 20010001454 A1
TITLE: Process for controlling foam in a treatment reactor

Summary of Invention Paragraph (17):
[0016] A typical method of controlling foam has comprised breaking the walls of the foam bubbles by manual or physical means. For example, some reactors have employed one or more cutting blades rotated by a motor. The blades spin through the foam layer, thereby rupturing foam bubbles, converting the foam back into a liquid. There are disadvantages to this approach for controlling foam, including maintenance and energy costs and efforts, particularly for a high rpm motor. Furthermore, the cutting blades may erode over time and require periodic replacement. Another disadvantage is that the motor that rotates the cutting blades is typically placed at the top of the reactor (outside the biosolids solution and the foam). However, the heat that can build up at the top of the reactor may shorten the life expectancy of the motor.

Summary of Invention Paragraph (25):
[0023] In the present invention, the perceived problem of foaming caused by the treatment process is turned into an advantage. The inventor has noted that foam can act as an insulator between the biosolids solution and the air in the top of the reactor. In a typical reactor, the reactor is vented to the atmosphere so that it is not under pressure. As a result, the temperature of the air in the reactor is affected by the temperature of outside the reactor; in some cases, the temperature of the air in the reactor may be the same as the ambient temperature outside. By refraining from destroying all the foam bubbles, it is possible to use the foam as an insulator between the biosolids solution and the air in the reactor. Preferably, a foam control system is operated to maintain a layer of foam having a depth of from about four to about eight feet, preferably about six feet.

Summary of Invention Paragraph (33):
[0031] As discussed above, the foam created during the treatment process can be used to advantage, as an insulator between the biosolids solution and the air in the reactor. Nonetheless, a reliable foam control system is necessary to maintain a layer of foam at a desirable depth and prevent an excess of foam from escaping from the reactor.

Summary of Invention Paragraph (35):
[0033] In one embodiment, the method comprises the additional or separate steps of generating a layer of foam on top of the biosolids solution, transferring a portion of the layer of foam from on top of the biosolids solution into the biosolids solution through a foam transfer pipe, and converting at least some of the portion of the layer of foam into liquid during transfer through the foam transfer pipe. The foam transfer pipe preferably includes a static mixer or other means that impart a dynamic mixing action to the foam, thereby rupturing or collapsing foam bubbles. Dynamic mixing action is action that imparts turbulence or energy that causes foam bubbles to collapse or rupture. One way to impart dynamic mixing action is to cause the fluid to have turbulent flow; another way is to mix the fluid or cause the fluid to move in a swirling motion. Alternately, the method may comprise the steps of transferring a portion of the foam from on top of the solution into the solution through the foam transfer pipe; mixing the foam in the foam transfer pipe so that at least some of the portion of foam is converted to liquid while passing through said foam transfer pipe; and drawing at least a portion of foam (which may be converted

to liquid) by suction through at least a portion of the foam transfer pipe. The source of the suction may be an outer nozzle of a jet aeration system similar to those described herein, except that one outer nozzle is not connected to an air header; instead, it is dedicated to the foam transfer pipe. As fluid flows through the inner nozzle, it generates a vacuum or draw in the outer nozzle that pulls or sucks liquified foam from a foam transfer pipe that is fluidly connected to the side of the outer nozzle.

Detail Description Paragraph (15):
[0053] The secondary cooling system is generally a liquid by-pass that transfers the reactor contents above the foam layer and through a jet-cooling nozzle. This action exposes the reactor contents to the atmosphere above the foam layer, thus causing the reactor contents to release heat. The secondary cooling system may be include a conduit 45 located outside the reactor which routes biosolids above the foam layer. This conduit 45 may attached to the pipe leading from the motive pump back into the reactor. An actuated valve 46 may be placed so that the biosolids solution's access to the conduit 45 is controlled, perhaps through the PLC based on the reading of the temperature sensor. The secondary cooling system may also comprise a cooling jet nozzle 47 at the downstream end of the cooling conduit. The cooling jet nozzle 47 injects the biosolids solution back into the reactor 33 at a predetermined location or height.

CLAIMS:

1. A process for the aerobic treatment of biosolids solution comprised of the products of waste water treatment and thermophilic bacteria capable of digesting mesophilic bacteria, said process comprising: (a) thickening the biosolids solution before it first enters a biosolids treatment reactor to a concentration of from about 3% to about 6% solids; (b) mixing a portion of biosolids solution with an oxygen-containing gas stream using a jet aeration device; (c) injecting a mixture of the oxygen-containing gas and biosolids solution into the reactor at a flow rate which introduces sufficient oxygen into the biosolids solution so that the treatment environment is substantially constantly aerobic; (d) controlling the temperature of the biosolids solution by adjusting the amount of shear generated through the jet aeration device; (e) generating a layer of foam on top of the biosolids solution; (f) transferring a portion of the foam from on top of the biosolids solution into the biosolids solution through a foam transfer pipe; and (g) converting at least some of the portion of the foam into liquid during transfer through the foam transfer pipe.

L9: Entry 2 of 8 File: USPT Sep 4, 2001

DOCUMENT-IDENTIFIER: US 6283676 B1
TITLE: Sequential aerobic/anaerobic solid waste landfill operation

Abstract Text (1):
Landfills including multiple lifts having horizontal piping layers and methods for their use to accelerate anaerobic and/or aerobic degradation of municipal solid waste to increase landfill capacity.

Brief Summary Text (37):
In one embodiment, this invention is a method for biodegrading municipal solid waste by sequential aerobic and anaerobic bioremediatoin. The method includes the steps of creating a landfill bioreactor having a bottom surface; locating leachate withdrawal piping on the landfill bottom surface; placing a first lift of waste material on top of the leachate withdrawal piping to form a first lift having a first lift top surface; placing a first piping layer on the top surface of the first lift; placing a second lift of waste on top of the first piping layer form a second lift having a second lift top surface; placing a second piping layer on the top surface of the second lift; and introducing air into the second lift using the first piping layer.

Drawing Description Text (3):
FIGS. 2-4 are side cross-section views of a landfill bioreactor of this invention that depict steps of a process of this invention for sequentially biodegrading layers of municipal solid waste;

Detailed Description Text (15):
The landfill lifts of this invention must include at least some compostable waste materials. Preferably, the waste material used to construct the landfill lifts will include at least 50% and preferably 75% or more of compostable material. Preferably, the waste material is municipal solid waste. Additionally, industrial wastes, sludges, and biosolids are typically commingled with the municipal solid waste. Each lift preferably has a thickness of from 5 feet to about 20 feet with a lift thickness of about 10 feet being preferred. This lift thickness allows air to penetrate into the landfill lifts above and below a given piping layer to cause accelerated aerobic decomposition of the compostable waste material.

Detailed Description Text (23):
Variations in the method for mediating solid waste using a plurality of horizontally spaced piping layers are within the scope of this invention. For example, anaerobic conversion of waste lifts may be replaced by aerobic conversion in the event, for example that insufficient moisture and water is available to maintain the landfill at a desirable moisture levels. This may occur seasonally in landfills during time of extremely cold weather or during periods of drought and the absence of sufficient moisture in the landfill can promote undesirable landfill fires.

L9: Entry 3 of 8 File: USPT Nov 23, 1999

DOCUMENT-IDENTIFIER: US 5989428 A
TITLE: Controlling wastewater treatment by monitoring oxygen utilization rates

Detailed Description Text (34):
A means for maintaining a maximum potential BIORATE in an initial designated unaerated reaction zone for the culture through the defined admixture of influent wastewater and biomass from the principal and final designated reaction zone, a means for introducing dissolved oxygen into the specified principal reaction zone(s) for operation under preselected area and pre-programmed aeration sequences, a means for interrupting the influent wastewater to the initial designated reaction zone, a means for removing a fraction of the supernatant clear treated wastewater after a set sequence of non-aeration, a means for detecting and measuring the position of the biosludge interface layer, a means for interacting the biosolids interface with the biosludge wasting program with the detection of the biosludge interface position, a means for setting automatic time sequences for automatic operations, a means for operation of the principal final designated reaction volume as a variable volume complete-mix unit, a means for measuring the biorate in the principal final designated reaction volume using a dissolved oxygen sensor properly placed in that basin volume, a means for measuring the rate of change of dissolved oxygen concentration and making comparison with the actual respiration rate to control the rate of introduction of dissolved oxygen into the treatment system, a means of operation for maximising the ratio of potential oxygen utilization rate (determined through defined ad mixture of influent and biomass from the principal reactor) to oxygen utilisation rate in the principal reactor, a means for automatically setting the duration of the aeration sequence as measured and calculated by the actual respiration rate, a means for optimising the use of aeration power to effect nitrification and denitrification, a means of operating the system through BIORATE control to effect maximum biological phosphorus removal, a means for operating the process so that the principal final designated aeration volume operates at an approximate biological steady state actual respiration rate (corrected for active fraction of biomass), a means for using the dissolved oxygen depletion rate that results from interrupting the air flow to the basin and a biomass concentration settling algorithm to provide the BIORATE parameter, a means for removing near surface supernatant liquor at from about 20 cm below the liquid surface at a constant rate to equivalent liquid depths up to two metres in a preferred 5-6 metre basin depth wherein the reactor configurations permit end basin or across basin centre feed location, and the reactor configurations permit transverse or longitudinal location of effluent decanting devices, whereby the apparatus and process is used to treat wastewater.

Detailed Description Text (59):
This invention, in its preferred embodiment is specific to reaction conditions that are generated and not necessarily to numbers and zones of the reactor volumes through which the said reactants pass. This is not a limitation on the embodiment. Principally the volume fraction as described as the fed-batch reactor undergoes complete mix aeration, during a specific aeration cycle, for which variable volume complete mix kinetics can be ascribed to that specific volume. Following the specific non-aeration sequence, during which time a solids layer and an upper supernatant layer segregate, the relative depths being dependent upon the contact flow history of influent wastewater and the mixed liquor solids concentration of a stream of solids, which is directed from the principal variable--volume completely mixed volume to the influent stream of wastewater for admixture. This embodiment of

operation requires a means of removing a specified fraction of the supernatant upper layer during the continued non-aeration sequence. When this event is completed, the aerated sequence is continued with further admixture of reactants as prescribed previously.

CLAIMS:

4. The method of claim 1, wherein up to 40 percent of the design depth of the variable depth reactor is removed during the decantation step at a rate that does not cause removal of settled solids from within a settled sludge layer in the reactor.

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L9: Entry 4 of 8 File: USPT Jan 26, 1999

DOCUMENT-IDENTIFIER: US 5862610 A
TITLE: Method for coating dry pellets made of waste bio-solids with waste bio-solids

Abstract Text (1):
Method and apparatus are provided for reprocessing dry pellets made of waste bio-solids in which the pellets and wet sludge waste bio-solids are supplied to the inlet of a material combining conveyor whose angular position can be adjusted. The pellets are coated with the sludge as they travel along the material combining conveyor to its output which feeds a dryer or oven. By adjusting the speed, length and angular position of the material combining conveyor, the amount of sludge coated onto the pellets can be controlled. The material combining conveyor is preferably a sealed shaftless screw conveyor that extends in a generally veritcal direction so that pellets not properly coated fall by gravity to the conveyor inlet. Dry pellets and wet sludge can be supplied from separate bins to a common feed conveyor such as a shaftless screw conveyor which conveys the mixture to the input of the material combining conveyor.

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L9: Entry 5 of 8 File: USPT Jan 5, 1999

DOCUMENT-IDENTIFIER: US 5855664 A
TITLE: Solid waste landfill cover material and method of extending the useful life of a solid waste disposal landfill

Detailed Description Text (27):
In usual practice, the waste material placed in a Municipal Solid Waste (MSW) disposal landfill is leveled, compacted and then covered with daily/initial cover material for a short period of time, typically overnight. If it is necessary to cover the disposed MSW for a longer period of time, a thicker layer of daily/initial cover material must be applied. The primary problem associated with the use of dirt, sand or earthen material is that large quantities of the cover material are necessary to cover the disposed municipal solid waste. Because dirt, sand or earthen material do not decompose/biodegrade or compress to any great degree, there is a substantial loss of available volume for waste, which is forever occupied by the daily applied layers of dirt, sand, earthen material or the like. This is particularly a problem with MSW disposal landfill that are required to be covered at the end of each day of operation. In this instance, a layer of space six inches in depth across the entire landfill working face is lost everyday to the dirt, sand, earthen material or the like which will forever occupy this space. This loss of available space in the landfill, not to mention the cost of the cover material, results in substantial revenue losses to landfill operators. The manufactured Construction and Demolition (C&D) disposal debris RSM product serves as a substitute specification particle sized material replacing the normally used dirt, sand, earthen or the like daily cover material.

Detailed Description Text (29):
In accordance with the first embodiment, at the subtitle "D" MSW disposal landfill, Class I solid waste disposal landfill, MSW disposal landfill operating within a slurry wall leachate containment system or other approved site location, the received MSW is compacted and leveled into place at the end of the business day. Next, a layer of manufactured C&D disposal debris RSM product, which is the "actual" substitute/alternative daily cover material layer is mechanically applied/spread on top of the compacted and leveled disposed municipal solid waste until the required six inch thickness is achieved. The C&D-RSM product which is applied over the top portion of the disposed MSW substitutes/replaces the normally used dirt, sand or earthen daily/initial cover material. When applied to a typical 5,000 square foot working face area of a MSW disposal landfill 125-150 tons of C&D-RSM product are applied. Equipment utilized for spreading the C&D disposal debris RSM product can be, for example, a dozer, wheel loader, self-loading and/or unloading pan or the like. The proper concentration of formulated solution is next applied by spray method soaking the applied RSM product layer until it becomes well saturated. It is at this point, when the C&D disposal debris RSM product is soaked with the formulated solution, that it becomes acceptable and approved daily/initial cover material.

Detailed Description Text (35):
The boric acid in the formulated solution serves two distinct purposes. First, the boric acid acts as a disinfectant temporarily controlling any potential disease producing micro-organisms which may be contained within the C&D-RSM substitute daily cover product layer. Furthermore, any disease producing organisms which may be present on any de minimis amounts of municipal solid waste which may protrude from the applied daily cover material are also temporarily disinfected. Additionally, any

disease producing micro-organisms which may be travelling upwards with vapors and gasses as they migrate through the disposed municipal solid waste and escape to the surface must travel through this treated C&D-RSM daily cover layer and are also temporarily disinfected. Therefore, the potential disease producing micro-organisms are controlled at their source before they can be carried or spread by vectors to humans. This satisfies the environmental regulatory authority daily cover requirement of controlling disease vectors.

Detailed Description Text (95):
After serving its purpose of covering the disposed municipal solid waste for the required one day time period this completed daily/initial cover layer of treated C&D disposal debris RSM product is buried under garbage, putrescible household waste, rubbish or the like on the next day of landfill operation.

Detailed Description Text (96):
The decomposition/biodegradation of the buried C&D disposal debris RSM daily/initial cover product layer proceeds by utilizing the natural occurring microbes available from the disposed municipal solid waste which trickle down to this treated region.

Detailed Description Text (99):
Class A (Grade I) domestic waste water residuals (sludge), Class B (Grade II) domestic waste water residuals (sludge) when utilized as biosolid fertilizer material and regulated by the State of Florida's Administrative Code (F.A.C.) Chapters 62-640 and/or its equivalent can be used also. Additionally, a controlled time release fertilizer can be used. The actual fertilizer materials to attain optimal levels of the primary nutrients Nitrogen, Phosphorous and Potassium (NPK) can be but are not limited to, nitrogen (amines, nitrates, ammonia salts and the like), phosphorous-phosphates (calcium, super phosphate, ammonium phosphate and the like), potassium (potassium sulfate, potassium nitrate, potassium carbonate and the like). Additionally, secondary nutrients (trace elements) such as boron, copper, iron, manganese, molybdem, zinc and the like should be also added. Adjustments to the levels of primary nutrients, secondary nutrients (trace metals) as well as the pH levels are made as often as required to maintain optimal nutrient conditions for rapid biodegradation/decomposition of the applied C&D-RSM daily/initial product layer. Caution should be exercised in applying the nutrient mixtures to the disposed municipal solid waste (MSW) material. Concentrated nutrient application may accelerate excessive biodegradation, resulting in spontaneous combustion of the "covered" MSW disposal material. Furthermore, depending upon the amount of biodegradable organic material contained within the solid waste disposal material received at the MSW disposal landfill, the addition of nutrients (fertilizer) may not be required. All of these elements combine to create a manufactured product with known specification which satisfy known requirements. Additionally, this product is reproduced in such a way that a guarantee can be issued.

Detailed Description Text (132):
In a preferred process method of this second embodiment, the construction and demolition disposal debris raw material/feed stock is delivered to the manufacturing site. The Class III/commercial solid waste raw material/feed stock is delivered to the same manufacturing site. At the permitted/licensed or approved manufacturing/processing site, both of these raw material/feed stocks are fed simultaneously into a shredder equipped with three inch openings in its discharge grates. The resulting commingled inseparable mixture of shredder output materials is the manufactured C&D-Class III recovered screened materials substitute daily cover product of this related embodiment. After application of this substitute daily/cover product over disposed municipal solid waste, it is treated by spray method with the formulated solution until the desired conditions are achieved. This treatment enables this applied product to satisfy the specific environmental regulatory authority "Daily Cover Requirements" and qualify as an approved substitute daily/initial cover material. This completed substitute daily/initial cover product layer of combined Class III and C&D debris RSM products are buried under municipal solid waste material, i.e., garbage, putrescible household waste, refuse, rubbish or the like on the next day of landfill operation. As this completed cover material layer decomposes/biodegrades, valuable landfill disposal space is regained.

Detailed Description Text (144):

After application of this substitute daily/cover product over disposed municipal solid waste, it is treated by spray method with the formulated solution until the desired conditions are achieved. This treatment enables this applied product to satisfy the specific environmental regulatory authority "Daily Cover Requirements" and qualify as an approved substitute daily/initial cover material. This completed substitute daily/initial cover product layer of combined automobile shredder residue and C&D debris RSM products are buried under municipal solid waste material, i.e., garbage, putrescible household waste, refuse, rubbish or the like on the next day of landfill operation. As this completed cover material layer decomposes/biodegrades, valuable landfill disposal space is regained.

Detailed Description Text (173):
After application of this substitute daily/initial product over disposed municipal solid waste, it is treated by spray method with the formulated solution until the desired conditions are achieved. This treatment enables this applied product to satisfy the specific environmental regulatory authority "Daily Cover Requirements" and qualify as an approved substitute daily/initial cover material. This completed substitute daily/initial cover product layer of combined municipal solid waste RSM and construction and demolition disposal debris RSM product are buried under municipal solid waste, i.e., garbage, putrescible household waste, refuse or the like on the next day of landfill operation. As this completed cover material layer decomposes/biodegrades, valuable landfill disposal space is regained thus extending the useful life of a solid waste disposal landfill utilizing this substitute daily/initial cover product.

CLAIMS:

11. A method as recited in claim 10 wherein said recovered screen material product is sprayed and soaked with said solution and stored prior to said step of applying said layer wherein said stored recovered screen material is available for subsequent use as said substitute daily/initial solid waste disposal landfill cover material.

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L9: Entry 6 of 8 File: USPT Apr 21, 1998

DOCUMENT-IDENTIFIER: US 5741346 A
TITLE: Mineral and organic fertilizer

Brief Summary Text (5):
In the case of the hog industry, often the biosolid is produced at a much greater rate than it can be used on surrounding farm land, and accumulates in large quantities posing environmental problems. In Eastern North Carolina, for example, lagoon storage areas have become completely filled and fluid upper layers have spilled into river systems causing widespread pollution. See "Hogging the Table," Time, Mar. 18, 1996 and "Hog Heaven-and Hell," U.S. News and World Report, Jan. 22, 1996. There has been no cost effective means of dewatering, drying, and converting the biosolid from hog waste into a practical, balanced fertilizer.

Detailed Description Text (3):
Biosolid is dredged from the bottom of a hog waste lagoon and belt pressed to dewater to about 80% or less water content. To 100 Kg of the dewatered biosolid is added with vigorous blending, 100 kg of granite fines, which were previously kiln heated to 200.degree. C. Blending is continued until the blend has a moisture content of about 20% or less. The blend is pelletized in a rotary disk pelletizing apparatus to achieve pellet size in the range of about 1 mm to about 3 mm in diameter with a mean of about 2 mm. The pellets are passed through an air stream where they are heated at 150.degree. C. for fifteen minutes. The dried pellets are screened for size, chemically analyzed, and conveyed to dry storage bins to wait packaging and shipping. The pellets are prepared for shipment by placing them in double layer bags, labeled to indicate the exact nutrient content of the fertilizer and sealed.

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L9: Entry 7 of 8 File: DWPI Jul 27, 2000

DERWENT-ACC-NO: 2000-499191
DERWENT-WEEK: 200055

TITLE: Method for treating waste bio-solids for fertilizers, involves reprocessing high density pellets in feed conveyor which is obtained from shaftless screw conveyor opening

Basic Abstract Text (2):
DETAILED DESCRIPTION - Method for treating waste bio-solids involves supplying dry pellets and wet sludge into an inlet of a screw feed conveyor, conveying the mixture from a feed conveyor outlet into an inlet (38) of a sealed shaftless screw material combining conveyor (44) and subsequently conveying the coated pellets into a drier along the upward direction. The high density pellets falling through an opening in the material combining conveyor by gravity is conveyed and reprocessed with the material from the feed conveyor.

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L9: Entry 7 of 8 File: DWPI Jul 27, 2000

DERWENT-ACC-NO: 2000-499191
DERWENT-WEEK: 200055

TITLE: Method for treating waste bio-solids for fertilizers, involves reprocessing high density pellets in feed conveyor which is obtained from shaftless screw conveyor opening

INVENTOR: LIPPERT, P

PATENT-ASSIGNEE: ATARA ENVIRONMENTAL INC (ATARN)

PRIORITY-DATA: 1999WO-US01891 (January 25, 1999)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 200043129 A1	July 27, 2000	E	017	B05B015/00
AU 9924805 A	August 7, 2000		000	B05B015/00

DESIGNATED-STATES: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES FI GB GD GE HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT UA UG UZ VN YU ZW AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW NL OA PT SD SE SZ UG ZW

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
WO 200043129A1	January 25, 1999	1999WO-US01891	
AU 9924805A	January 25, 1999	1999AU-0024805	
AU 9924805A	January 25, 1999	1999WO-US01891	
AU 9924805A		WO 200043129	Based on

INT-CL (IPC): B01 F 7/08; B05 B 15/00; C05 F 11/08

ABSTRACTED-PUB-NO: WO 200043129A
BASIC-ABSTRACT:

NOVELTY - Method for treating dry pellets with wet sludge of waste bio-solids involves supplying the raw materials into an inlet of a screw feed conveyor and subsequently conveying the mixture upwards from an outlet of a shaftless screw conveyor (44) into a drier. Higher density pellets falling by gravity through an opening in the screw conveyor inlet is reprocessed with the mixture from feed conveyor.

DETAILED DESCRIPTION - Method for treating waste bio-solids involves supplying dry pellets and wet sludge into an inlet of a screw feed conveyor, conveying the mixture from a feed conveyor outlet into an inlet (38) of a sealed shaftless screw material combining conveyor (44) and subsequently conveying the coated pellets into a drier along the upward direction. The high density pellets falling through an opening in the material combining conveyor by gravity is conveyed and reprocessed with the material from the feed conveyor.

USE - For fertilizers.

ADVANTAGE - The processing apparatus prevents the entry of dust into the drier or oven from the dry pellets. The characteristics of the reprocessed pellets obtained from the material combining conveyor is controlled by a number of parameters. The sludge is directly supplied into the vertical feed conveyor.

DESCRIPTION OF DRAWING(S) - The figure shows a top schematic view of a reprocessing system.

Horizontal feed conveyor 12

Dry pellet bin 20

Conveyor 24,34

Waste sludge bin 30

Feed conveyor inlet 38

Shaftless screw material combining conveyor 44

ABSTRACTED-PUB-NO: WO 200043129A
EQUIVALENT-ABSTRACTS:

CHOSEN-DRAWING: Dwg.1/3

DERWENT-CLASS: D15 P42
CPI-CODES: D04-A; D04-B;

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L9: Entry 8 of 8 File: DWPI Jan 26, 1999

DERWENT-ACC-NO: 1999-130841
DERWENT-WEEK: 199913

TITLE: Coating of dry pellets made of waste bio-solids with waste bio-solids - by feeding pellets and wet sludge into an incline-adjustable shaft-less screw conveyor which feeds a dryer or oven

INVENTOR: LIPERT, P

PATENT-ASSIGNEE: ATARA CORP (ATARN)

PRIORITY-DATA: 1995US-0580338 (December 28, 1995)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 5862610 A	January 26, 1999		007	F26B007/00

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
US 5862610A	December 28, 1995	1995US-0580338	

INT-CL (IPC): B09 B 3/00; C12 M 1/00; F26 B 7/00

ABSTRACTED-PUB-NO: US 5862610A
BASIC-ABSTRACT:

The method for treating dry pellets made from waste bio-solids with wet sludge of waste bio-solids to change the size and/or liquid to solid density of the pellets for delivery to a dryer comprises supplying dry pellets and wet sludge to an inlet of a horizontal screw feed conveyor and mixing the dry pellets and wet sludge to form a mixture while being conveyed to an outlet of the feed conveyor. This is followed by supplying the mixture from the feed conveyor outlet to an inlet of a lower end of a sealed shaftless screw material combining conveyor having an open centre which extends vertically. The mixture is then conveyed from the inlet of the material combining conveyor upwardly along the length of the conveyor to an outlet at its upper end from which to be discharged to a dryer. The pellets are coated with sludge during the upward conveying of the mixture and higher density dry pellets fall by gravity back through the conveyor open centre to the material combining conveyor inlet to further mix with the mixture from the feed conveyor.

USE - For handling and disposal of bio-solids such as human waste which is made into pellets containing nitrogen in slow release form. These pellets may be combined with standard fertiliser, or may be used directly on agricultural areas.

ADVANTAGE - Dry pellets are evenly coated by the wet sludge. The moisture and the recoated sludge content of the reprocessed pellets is adjustable in different ways. Dust and spills are reduces, with decreases chance of flashback explosions.

ABSTRACTED-PUB-NO: US 5862610A

EQUIVALENT-ABSTRACTS:

CHOSEN-DRAWING: Dwg.1/3

DERWENT-CLASS: C04 D15 J08 P43 Q76
CPI-CODES: C14-T; D04-B10; J08-F02;

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Search Results - Record(s) 1 through 2 of 2 returned.

☐ 1. Document ID: US 20020098982 A1

L10: Entry 1 of 2 File: PGPB Jul 25, 2002

PGPUB-DOCUMENT-NUMBER: 20020098982
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020098982 A1

TITLE: Production and use of biosolid granules

PUBLICATION-DATE: July 25, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Burnham, Jeffrey C.	Naples	FL	US	

US-CL-CURRENT: 504/359; 504/117, 504/367, 71/64.02, 71/64.11

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw. Desc | Image

☐ 2. Document ID: US 20020098982 A1 WO 200257862 A2

L10: Entry 2 of 2 File: DWPI Jul 25, 2002

DERWENT-ACC-NO: 2002-698524
DERWENT-WEEK: 200316

TITLE: Granular nutrient and micro-organism use for bioremediation and crop fertilizer has a number of layers and contains biosolid material

INVENTOR: BURNHAM, J C

PRIORITY-DATA: 2001US-272469P (March 2, 2001), 2001US-262631P (January 22, 2001), 2002US-0051387 (January 22, 2002)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 20020098982 A1	July 25, 2002		000	A01N025/28
WO 200257862 A2	July 25, 2002	E	025	G05F000/00

INT-CL (IPC): A01 N 25/00; A01 N 25/12; A01 N 25/28; A01 N 63/00; G05 F 0/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw. Desc | Image

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Search Results - Record(s) 1 through 10 of 30 returned.

☐ 1. Document ID: US 20030091737 A1

L21: Entry 1 of 30 File: PGPB May 15, 2003

PGPUB-DOCUMENT-NUMBER: 20030091737
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030091737 A1

TITLE: Process for the production or coating of granules, apparatus for carrying out the process, and granules obtainable thereby

PUBLICATION-DATE: May 15, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Alt, Hans Christian	Gelnhausen		DE	
Harthun, Andreas	Moembris		DE	
Luethi, Joachim	Koenigswinter		DE	
Goelz, Andreas	Rodenbach		DE	
Schulze, Stefan	Grobkrotzenburg		DE	
Wille, Martin	Frankfurt		DE	

US-CL-CURRENT: 427/213; 118/303

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 2. Document ID: US 4427719 A

L21: Entry 2 of 30 File: USPT Jan 24, 1984

US-PAT-NO: 4427719
DOCUMENT-IDENTIFIER: US 4427719 A

TITLE: Method of dedusting metal sulfate granules

DATE-ISSUED: January 24, 1984

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Moore; William P.	Hopewell	VA		

US-CL-CURRENT: 427/205; 427/184, 427/214, 427/221, 427/240, 427/242, 427/385.5, 427/399

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 3. Document ID: JP 2002199825 A

L21: Entry 3 of 30 File: JPAB Jul 16, 2002

PUB-NO: JP02002199825A
DOCUMENT-IDENTIFIER: JP 2002199825 A
TITLE: GRANULAR EXCRETA TREATING MATERIAL FOR ANIMAL AND METHOD FOR PRODUCING THE SAME

PUBN-DATE: July 16, 2002

INVENTOR-INFORMATION:

NAME	COUNTRY
ITO, HIROSHI	

INT-CL (IPC): A01 K 1/015

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 4. Document ID: JP 2001302301 A

L21: Entry 4 of 30 File: JPAB Oct 31, 2001

PUB-NO: JP02001302301A
DOCUMENT-IDENTIFIER: JP 2001302301 A
TITLE: GRANULAR MATERIAL OF READY-MIXED CONCRETE SLUDGE AND ITS PRODUCTION PROCESS

PUBN-DATE: October 31, 2001

INVENTOR-INFORMATION:

NAME	COUNTRY
NAKAJIMA, YUTAKA	
HASHIMOTO, MASAYUKI	
MAKI, TAKATERU	
HONMA, MASANORI	
SEKI, TETSUO	

INT-CL (IPC): C04 B 18/16; B09 B 3/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

☐ 5. Document ID: JP 08337407 A

L21: Entry 5 of 30 File: JPAB Dec 24, 1996

PUB-NO: JP408337407A
DOCUMENT-IDENTIFIER: JP 08337407 A
TITLE: GRANULATING AND DEPHOSPHORIZNG DEVICE

PUBN-DATE: December 24, 1996

INVENTOR-INFORMATION:

NAME	COUNTRY
NAKAMURA, TAKESHI	
FUJII, MASAHIRO	
ARIYAMA, TADATOSHI	

INT-CL (IPC): C01 B 25/45; B01 J 2/00; C02 F 1/58

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw. Desc | Image

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6. Document ID: JP 08057443 A

L21: Entry 6 of 30 File: JPAB Mar 5, 1996

PUB-NO: JP408057443A
DOCUMENT-IDENTIFIER: JP 08057443 A
TITLE: GRANULATION TREATMENT OF INDUSTRIAL WASTE, GRANULATED MATTER AND CONCRETE STRUCTURE

PUBN-DATE: March 5, 1996

INVENTOR-INFORMATION:

NAME	COUNTRY
MORITA, KANAME	
FUTAMURA, SEIJI	

INT-CL (IPC): B09 B 3/00; B09 B 3/00; C04 B 18/30

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw. Desc | Image

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7. Document ID: JP 03169400 A

L21: Entry 7 of 30 File: JPAB Jul 23, 1991

PUB-NO: JP403169400A
DOCUMENT-IDENTIFIER: JP 03169400 A
TITLE: GRANULATING AND DEWATERING METHOD OF SLUDGE

PUBN-DATE: July 23, 1991

INVENTOR-INFORMATION:

NAME	COUNTRY
KATO, TATSUO	
NARUTOMI, SHUSUKE	
ENDO, KAZUO	

US-CL-CURRENT: 264/15
INT-CL (IPC): C02F 11/14; B01J 2/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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8. Document ID: JP 03169399 A

L21: Entry 8 of 30 File: JPAB Jul 23, 1991

PUB-NO: JP403169399A
DOCUMENT-IDENTIFIER: JP 03169399 A
TITLE: GRANULATING AND DEWATERING METHOD OF SLUDGE

PUBN-DATE: July 23, 1991

INVENTOR-INFORMATION:

NAME	COUNTRY
KATO, TATSUO	
NARUTOMI, SHUSUKE	
ENDO, KAZUO	

INT-CL (IPC): C02F 11/14; B01J 2/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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9. Document ID: JP 2002320961 A

L21: Entry 9 of 30 File: DWPI Nov 5, 2002

DERWENT-ACC-NO: 2003-098477
DERWENT-WEEK: 200309
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TITLE: Processing of waste water, involves aerating filled layer effluent, supplying alkali to filled layer, nitrifying granular zeolite-absorbed ammonia by microbe, ejecting nitrate nitrogen waste water from filled layer

PRIORITY-DATA: 2001JP-0132291 (April 27, 2001)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 2002320961 A	November 5, 2002		007	C02F001/28

INT-CL (IPC): B01 D 24/00; B01 D 29/66; B01 J 20/06; B01 J 20/34; C02 F 1/28; C02 F 1/58; C02 F 3/34; C02 F 9/00; C02 F 11/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Clip Img | Image

☐ 10. Document ID: JP 2002199825 A

L21: Entry 10 of 30 File: DWPI Jul 16, 2002

DERWENT-ACC-NO: 2002-631009
DERWENT-WEEK: 200268

TITLE: Granular excrement treating material for animal has coating layer which contains 0.1 percentage weight of drying solid substances

PRIORITY-DATA: 2000JP-0404948 (December 29, 2000)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 2002199825 A	July 16, 2002		015	A01K001/015

INT-CL (IPC): A01 K 1/015

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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Search Results - Record(s) 11 through 20 of 30 returned.

☑ 11. Document ID: CN 1346819 A

L21: Entry 11 of 30 File: DWPI May 1, 2002

DERWENT-ACC-NO: 2002-619805
DERWENT-WEEK: 200267

TITLE: Composite fertilizer and its preparing process involves fermenting organic solid waste, proportionally mixing it with the others, puffing, spraying microbes, granulating, coating, drying and cooling

INVENTOR: HUANG, X; SUN, C ; XIAO, S

PRIORITY-DATA: 2001CN-0134728 (November 9, 2001)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
CN 1346819 A	May 1, 2002		000	C05F011/08

INT-CL (IPC): C05 F 11/08; C05 G 1/00; C05 G 5/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 12. Document ID: JP 2001049273 A

L21: Entry 12 of 30 File: DWPI Feb 20, 2001

DERWENT-ACC-NO: 2001-240685
DERWENT-WEEK: 200149

TITLE: Solid industrial fuel for use during cement baking comprises crushed granules of fiber-reinforced resin waste as core layer and solid composite particles as sheath layer

PRIORITY-DATA: 1999JP-0227525 (August 11, 1999)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 2001049273 A	February 20, 2001		004	C10L005/48

INT-CL (IPC): B29 B 9/10; B29 B 17/00; C10 L 5/48

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 13. Document ID: JP 09122673 A

L21: Entry 13 of 30 File: DWPI May 13, 1997

DERWENT-ACC-NO: 1997-314920
DERWENT-WEEK: 199729

TITLE: Waste water treatment - by filtering suspended solid in water using granular filter layer

PRIORITY-DATA: 1995JP-0283310 (October 31, 1995)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 09122673 A	May 13, 1997		016	C02F003/06

INT-CL (IPC): C02 F 3/06; C02 F 3/08; C02 F 3/12; C02 F 3/34

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 14. Document ID: DE 19604659 C1 JP 10277578 A

L21: Entry 14 of 30 File: DWPI Apr 17, 1997

DERWENT-ACC-NO: 1997-214057
DERWENT-WEEK: 199901

TITLE: Waste water purification bio-reactor - containing fixed granular bed on coarse solids above aeration system, has lift pumps recirculating and cleaning granules coated with bio-film to prevent accumulation of biomass and may be operated with co- or counter current flow

INVENTOR: LOHMANN, G; STEGER, M ; TIEFEL, H

PRIORITY-DATA: 1996DE-1004659 (February 9, 1996), 1997JP-0089643 (April 8, 1997)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
DE 19604659 C1	April 17, 1997		007	C02F003/00
JP 10277578 A	October 20, 1998		007	C02F003/08

INT-CL (IPC): C02 F 3/00; C02 F 3/02; C02 F 3/08; C02 F 3/28

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 15. Document ID: JP 09047760 A JP 3156956 B2

L21: Entry 15 of 30 File: DWPI Feb 18, 1997

DERWENT-ACC-NO: 1997-187426
DERWENT-WEEK: 200124

TITLE: Treatment for organic waste water - comprises adding phosphorus absorptive

fine particles to waste water, and passing waste water through filling layer consisting of granulated zeolite mineral, etc

PRIORITY-DATA: 1995JP-0204746 (August 10, 1995)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 09047760 A	February 18, 1997		004	C02F001/28
JP 3156956 B2	April 16, 2001		004	C02F001/28

INT-CL (IPC): C02 F 1/28; C02 F 1/58

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 16. Document ID: DE 19502273 A1

L21: Entry 16 of 30 File: DWPI Aug 1, 1996

DERWENT-ACC-NO: 1996-355093
DERWENT-WEEK: 199636

TITLE: Sludge disposal process by incineration of dewatered and dried sludge granulate particles - uses rapid cooling of the incineration gas, pref. between moist layers of sludge particle granulate beds in the dryer to reduce heavy metal content

INVENTOR: BASTGEN, W

PRIORITY-DATA: 1995DE-1002273 (January 26, 1995)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
DE 19502273 A1	August 1, 1996		004	C02F011/10

INT-CL (IPC): A62 D 3/00; C02 F 11/10; C02 F 11/12

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 17. Document ID: JP 06063563 A

L21: Entry 17 of 30 File: DWPI Mar 8, 1994

DERWENT-ACC-NO: 1994-114535
DERWENT-WEEK: 199414

TITLE: Treatment of fluoride-contg. water regardless of fluoride concn. - by adding waste water used for regenerating deteriorated fluoride adsorbent packed layer to water before feeding to granular calcium carbonate packed layer

PRIORITY-DATA: 1992JP-0248625 (August 25, 1992)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 06063563 A	March 8, 1994		004	C02F001/58

INT-CL (IPC): C02F 1/28; C02F 1/58

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 18. Document ID: SU 1787959 A1

L21: Entry 18 of 30 File: DWPI Jan 15, 1993

DERWENT-ACC-NO: 1994-063129
DERWENT-WEEK: 199408

TITLE: Removing hydrogen sulphide and sulphur cpds from waste - by contact with granular layer carrying microorganisms in presence of peptone

INVENTOR: KATSENOVICH, E P; KOGAN YU, A ; RUBIN, D A

PRIORITY-DATA: 1990SU-4874492 (October 12, 1990)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
SU 1787959 A1	January 15, 1993		004	C02F003/34

INT-CL (IPC): C02F 3/34

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 19. Document ID: JP 92045609 B JP 58013817 A

L21: Entry 19 of 30 File: DWPI Jul 27, 1992

DERWENT-ACC-NO: 1992-282097
DERWENT-WEEK: 199234

TITLE: Dewatering soft and weak ground for building river bank - comprises forming granular dewatering agent layer on surface of dirty sludge (J5 26.1.83)

PRIORITY-DATA: 1981JP-0112346 (July 20, 1981)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 92045609 B	July 27, 1992		003	E02D003/10
JP 58013817 A	January 26, 1983		000	E02D003/10

INT-CL (IPC): E02D 3/10

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 20. Document ID: WO 8707851 A AU 8775852 A

L21: Entry 20 of 30 File: DWPI Dec 30, 1987

DERWENT-ACC-NO: 1988-014352
DERWENT-WEEK: 198802

TITLE: Water absorbing polymer granules - with coating of diatomaceous earth and useful in agriculture and horticulture

INVENTOR: ANDERTON, C J

PRIORITY-DATA: 1986AU-0006453 (June 18, 1986), 1987AU-0075852 (June 17, 1986)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 8707851 A	December 30, 1987	E	010	
AU 8775852 A	January 12, 1988		000	

INT-CL (IPC): B01J 2/30; C09K 17/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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Search Results - Record(s) 21 through 30 of 30 returned.

☐ 21. Document ID: JP 61213700 A

L21: Entry 21 of 30 File: DWPI Sep 22, 1986

DERWENT-ACC-NO: 1986-289477
DERWENT-WEEK: 198644

TITLE: Radioactive waste liquor treating process - comprises drying, granulation, and coating with insoluble film that controls diffusion of radiation e.g. acryl or epoxy! resin

PRIORITY-DATA: 1985JP-0054167 (March 20, 1985)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 61213700 A	September 22, 1986		004	

INT-CL (IPC): G21F 6/30; G21F 9/05

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 22. Document ID: JP 58114792 A JP 89004835 B

L21: Entry 22 of 30 File: DWPI Jul 8, 1983

DERWENT-ACC-NO: 1983-737875
DERWENT-WEEK: 198333

TITLE: Appts. for aerobic treatment of waste water - has packing layer, mixed packing-solid granules layer and support layer formed in tank

PRIORITY-DATA: 1981JP-0211677 (December 29, 1981)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 58114792 A	July 8, 1983		006	
JP 89004835 B	January 26, 1989		000	

INT-CL (IPC): C02F 3/04

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 23. Document ID: SU 899495 B

L21: Entry 23 of 30 File: DWPI Jan 25, 1982

DERWENT-ACC-NO: 1982-99499E
DERWENT-WEEK: 198246

TITLE: Removing dyes and solids from textile mfg. aq. waste - by passage through layer of polystyrene foam granules using ozonised air

INVENTOR: FAZULLINA, E P; GRITSENKO, A Y U ; NAZAROV, B G

PRIORITY-DATA: 1980SU-2941041 (June 16, 1980)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
SU 899495 B	January 25, 1982		005	

INT-CL (IPC): C02F 1/78

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 24. Document ID: SU 734478 B

L21: Entry 24 of 30 File: DWPI May 25, 1980

DERWENT-ACC-NO: 1981-03458D
DERWENT-WEEK: 198103

TITLE: Revolving furnace for solid and paste waste combustion - has lined chamber containing layer of refractory material granules

INVENTOR: IEVLEV, V V; ZHDANOV, V A

PRIORITY-DATA: 1977SU-2537401 (October 19, 1977)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
SU 734478 B	May 25, 1980		000	

INT-CL (IPC): F23G 5/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 25. Document ID: DE 2931949 A GB 2028294 A JP 55051787 A

L21: Entry 25 of 30 File: DWPI Feb 21, 1980

DERWENT-ACC-NO: 1980-14995C
DERWENT-WEEK: 198009

TITLE: Mineral salt fertiliser granulation and hygroscopicity redn. - by coating with clarification sludge solids

INVENTOR: TALBERT, N K

PRIORITY-DATA: 1978US-0932662 (August 10, 1978)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
DE 2931949 A	February 21, 1980		000	
GB 2028294 A	March 5, 1980		000	
JP 55051787 A	April 15, 1980		000	

INT-CL (IPC): C05F 7/00; C05G 1/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 26. Document ID: DE 2819086 A BR 7902659 A DE 2819086 C FR 2424611 A GB 2026228 A GB 2026228 B JP 54144600 A JP 87033560 B US 4363757 A

L21: Entry 26 of 30 File: DWPI Oct 31, 1979

DERWENT-ACC-NO: 1979-81044B
DERWENT-WEEK: 197945

TITLE: Solidifying aq. radioactive waste liq. - by granulating with absorbent solids and coating and/or embedding in solidifying matrix

INVENTOR: GEBAUER, R; KOESTER, R ; RUDOLPH, G

PRIORITY-DATA: 1978DE-2819086 (April 29, 1978)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
DE 2819086 A	October 31, 1979		000	
BR 7902659 A	January 15, 1980		000	
DE 2819086 C	September 12, 1985		000	
FR 2424611 A	December 28, 1979		000	
GB 2026228 A	January 30, 1980		000	
GB 2026228 B	August 11, 1982		000	
JP 54144600 A	November 10, 1979		000	
JP 87033560 B	July 21, 1987		000	
US 4363757 A	December 14, 1982		000	

INT-CL (IPC): G21F 9/16

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 27. Document ID: JP 54028266 A

L21: Entry 27 of 30 File: DWPI Mar 2, 1979

DERWENT-ACC-NO: 1979-28391B
DERWENT-WEEK: 197915

TITLE: Device for conveying sludge with hardening cement and adhesives - has pump for conveying granular solid slurry and pipes for conveying adhesive

PRIORITY-DATA: 1977JP-0093028 (August 4, 1977)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 54028266 A	March 2, 1979		000	

INT-CL (IPC): B01F 7/00; B01J 1/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 28. Document ID: JP 54026233 A

L21: Entry 28 of 30 File: DWPI Feb 27, 1979

DERWENT-ACC-NO: 1979-26784B
DERWENT-WEEK: 197914

TITLE: Granular heat insulating material - useful e.g. as hot-top material for molten metal on casting, produced from aluminium based and/or carbon powder etc.

PRIORITY-DATA: 1977JP-0092335 (August 1, 1977)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 54026233 A	February 27, 1979		000	

INT-CL (IPC): B22D 1/00; B22D 7/10; B22D 27/06; B22D 35/06

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 29. Document ID: JP 53092257 A

L21: Entry 29 of 30 File: DWPI Aug 12, 1978

DERWENT-ACC-NO: 1978-66345A
DERWENT-WEEK: 197837

TITLE: Fertiliser granules with low caking tendency and hygroscopicity - prepd. by coating granules obtd. from fermentation waste liquor with basic calcium cpd.

PRIORITY-DATA: 1977JP-0003201 (January 14, 1977)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 53092257 A	August 12, 1978		000	

INT-CL (IPC): B01J 2/30; C02C 5/00; C05F 5/00; C05G 3/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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☐ 30. Document ID: JP 52075572 A

L21: Entry 30 of 30 File: DWPI Jun 24, 1977

DERWENT-ACC-NO: 1977-56279Y
DERWENT-WEEK: 197732

TITLE: Minor element-contg. suspension - used for foliage sprays and coating granular fertiliser

PRIORITY-DATA: 1975JP-0149511 (December 17, 1975)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 52075572 A	June 24, 1977		000	

INT-CL (IPC): C05D 9/02; C05F 7/02; C05G 3/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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L21: Entry 7 of 30 File: JPAB Jul 23, 1991

DOCUMENT-IDENTIFIER: JP 03169400 A
TITLE: GRANULATING AND DEWATERING METHOD OF SLUDGE

Abstract Text (2):
CONSTITUTION: A sludge cake primarily dewatered by a primary dehydrator 1 is supplied to a granulating machine 2. As drying powder, incinerated ashes discharged from an incinerator 4 and collected by a cyclone 5 are supplied to the granulating machine 2 as they are or separated from rough particles by screening using a screening machine 9, or incinerated ashes collected by an electric precipitator 6 and separated from fine powder by a screening machine 10 or both of them are supplied. The sludge cake is pulverized by the granulating machine 2 to a degree not to break the water route of the cake, granulated into granules by rotation, and the granules are coated with the drying powder. In this way, sludge treatment cost becomes low and dewatering ratio is heightened with a little amount of the drying powder and the sludge cake become easy to be handled.

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L21: Entry 8 of 30 File: JPAB Jul 23, 1991

PUB-NO: JP403169399A
DOCUMENT-IDENTIFIER: JP 03169399 A
TITLE: GRANULATING AND DEWATERING METHOD OF SLUDGE

PUBN-DATE: July 23, 1991

INVENTOR-INFORMATION:

NAME	COUNTRY
KATO, TATSUO	
NARUTOMI, SHUSUKE	
ENDO, KAZUO	

ASSIGNEE-INFORMATION:

NAME	COUNTRY
HITACHI METALS LTD	

APPL-NO: JP01311410
APPL-DATE: November 29, 1989

INT-CL (IPC): C02F 11/14; B01J 2/00

ABSTRACT:

PURPOSE: To lower sludge treatment cost and improve dewatering ratio by using a drying powder with specified particle size in sludge granulating and dewatering processes consisting of granulating sludge into refined sludge granules after primary sludge dewatering while covering it with the dried powder as a dewatering agent and dewatering secondarily.

CONSTITUTION: A sludge cake primarily dewatered by a primary dehydrator 1 is supplied to a granulating machine 2. At the same time, incinerated ashes which are discharged from an incinerator 4 and screened by a screening machine 9 to separate fine powder is also supplied to the incinerator via a storage tank 10. The sludge cake is pulverized by the granulating machine 2 to a degree not to break the water route of the cake, granulated into granules by rotation, and the granules are coated with the incinerated ashes, from which fine powder is separated, and become refined sludge granules and are supplied to a secondary dehydrator 3. Here, the incinerated ashes as drying powder is screened by the screening machine 9 at about 500rpm rotation frequency at which the particles size becomes the highest water permeable size of about 10-100μm.

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L21: Entry 10 of 30 File: DWPI Jul 16, 2002

DERWENT-ACC-NO: 2002-631009
DERWENT-WEEK: 200268

TITLE: Granular excrement treating material for animal has coating layer which contains 0.1 percentage weight of drying solid substances

PATENT-ASSIGNEE: DAIKI KK (DAIKN)

PRIORITY-DATA: 2000JP-0404948 (December 29, 2000)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 2002199825 A	July 16, 2002		015	A01K001/015

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
JP2002199825A	December 29, 2000	2000JP-0404948	

INT-CL (IPC): A01 K 1/015

ABSTRACTED-PUB-NO: JP2002199825A
BASIC-ABSTRACT:

NOVELTY - The waste material of an organic substance e.g. fiber, water absorbing resin, coffee extract covers a core unit which is granularly formed, such that a coating layer contains 0.1 percentage weight of drying solid substances.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for the granular excrement treating material manufacturing method.

USE - For animal.

ADVANTAGE - Improves urinary absorption and urinary water retension, hence ensures excellent hygiene due to the coating layer.

DESCRIPTION OF DRAWING(S) - The figure shows the top view of the granular excrement treating material.

ABSTRACTED-PUB-NO: JP2002199825A
EQUIVALENT-ABSTRACTS:

CHOSEN-DRAWING: Dwg.1/2

DERWENT-CLASS: P14

WEST

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L21: Entry 11 of 30 File: DWPI May 1, 2002

DERWENT-ACC-NO: 2002-619805
DERWENT-WEEK: 200267

TITLE: Composite fertilizer and its preparing process involves fermenting organic solid waste, proportionally mixing it with the others, puffing, spraying microbes, granulating, coating, drying and cooling

INVENTOR: HUANG, X; SUN, C ; XIAO, S

PATENT-ASSIGNEE: XIANDAI AGRIC EQUIP SCI & TECHNOLOGY CO (XIANN)

PRIORITY-DATA: 2001CN-0134728 (November 9, 2001)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
CN 1346819 A	May 1, 2002		000	C05F011/08

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
CN 1346819A	November 9, 2001	2001CN-0134728	

INT-CL (IPC): C05 F 11/08; C05 G 1/00; C05 G 5/00

ABSTRACTED-PUB-NO: CN 1346819A
BASIC-ABSTRACT:

NOVELTY - A process for preparing composite organic, inorganic and/or microbe fertilizer involves fermenting organic solid waste, proportionally mixing it with the others, puffing, spraying microbes, granulating, coating, drying and cooling.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for the equipment to carry out the process.

USE - The process is for preparing composite organic, inorganic and/or microbe fertilizer.

ADVANTAGE - The process gives a fertilizer with a high content of nutrients, a fast action and no pollution of environment.

ABSTRACTED-PUB-NO: CN 1346819A
EQUIVALENT-ABSTRACTS:

CHOSEN-DRAWING: Dwg.0/0

DERWENT-CLASS: C04
CPI-CODES: C04-F01; C11-C09; C14-T;